ELECTRICAL REVIEW

AN ILLUSTRATED WEEKLY JOURNAL OF SCIENTIFIC AND ELECTRICAL PROGRESS.

VOL. 32. No. 21. WEEKLY. | NEW YORK, WEDNESDAY, MAY 25, 1898. | $3 PER ANNUM. SINGLE COPIES, 10 CENTS.

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Entered at the Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

Mr. Butler, superintendent of the northern division of the New England Telephone and Telegraph Company, recently received an envelope addressed as follows:

Burlington Vermont

Mr Butler

Hed Boss

Telafon Co

The envelope contained this letter:

May 9 Swanton Vermont

Mr Butler

I here you goin for ter bild telafon in dis town now I like for to show a good land for bild de telafon I sell you hole for 2.00 evry one for damages lake Stimets I spoke ter Mr Scarfe bout mine land but he dont pay nothing for de hole I wont sell no damages to him where is de man what pay Stimets for de poles $2.00 I want for to see him now some folks dont lake for de telafon pole on de land but I bin publik spirit man an like for see de biznez go on any body kno me Lemme kno when de oder man com here Yours truly

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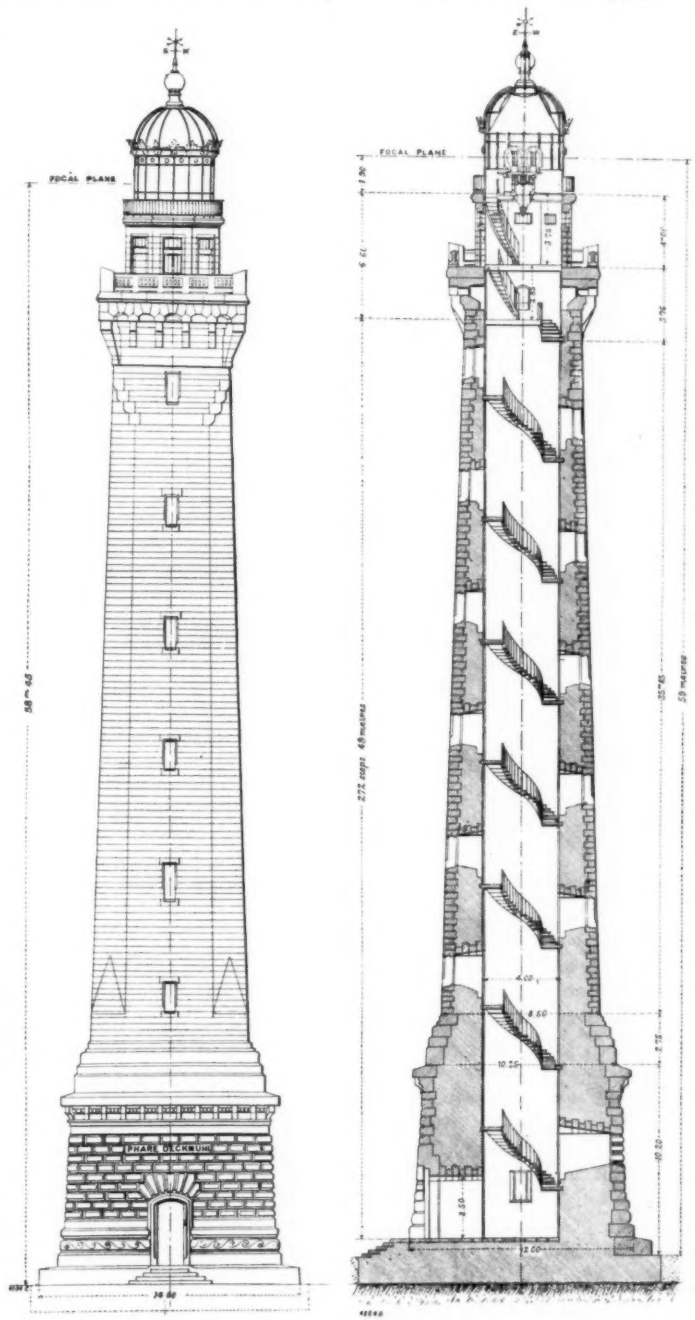
The police of New York city had a good scare one day last week. A citizen found a suspicious-looking object in the street, and informed a policeman of the fact. The officer pronounced it a Spanish bomb, and with great care and trepidation arrested the object. The sergeant at the station-house soaked the thing in a pail of water for two hours, and then examined it gingerly. The station-house telegraph operator diagnosed it as a worn-out dry battery.

Dr. Ph. Lenard, assistant professor of physics in the University of Heidelberg, was recently called to the chair of physics at Kiel.

That the motor fan is fast becoming recognized as an important factor in contributing to man's ease and comfort is evidenced by a leaflet sent out by an enterprising and evidently up-to-date restaurateur in Chicago, whose name is Brown. Mr. Brown says: "I have recently fitted up my place with steel ceilings and side walls, electric lights, motor fans, etc., making it cool, clean and attractive." Mr. Brown deserves success.

Trolley cars in Brooklyn, N. Y., have been noticed performing an unusual service. Several of them carry single-sheet advertising posters attached to the front fender. It has been suggested that circus advertisements would be especially effective in such a location. A trolley car with its fender covered with pictures of lions and tigers, and so on, coming toward the beholder at a high rate of speed, could not fail to be impressive.



ELEVATION AND SECTIONAL VIEWS OF THE NEW ELECTRIC LIGHTHOUSE ON THE BAY OF BISCAY.

The New Electric Lighthouse of Penmarch-Eckmuhl (Finistère).

The French Lighthouse Department has recently completed a new electric lighthouse, equipped with powerful twin lightning flash-lights, at Penmarch or Eckmuhl, in the Department of Finistère, on the Bay of Biscay. The accompanying engraving shows this lighthouse in elevation and in section.

The new lighthouse, placed at about 100 yards from the old one, is situated 50 nautical miles southeast of Ushant, at the extremity of the promontory of Penmarch, one of the most dangerous points of that inhospitable coast. The first impulse to the erection of the new lighthouse was given by a generous bequest of the Marquise de Blocqueville, who left the sum of 300,000 francs for the purpose of a monumental tower and a powerful light for the better protection of the Breton coast and its inhabitants, and to the memory of her father, Maréchal Davoust, Prince d'Eckmuhl, who was one of the most faithful adherents of Napoleon I., and whose statue in bronze adorns the vestibule of the lighthouse tower. Hence the name of Phare d'Eckmuhl officially given to the new lighthouse, though, for practical purposes, the name of Penmarch Light is more to the point, and as such the light will probably always be known to the mariner.

The new masonry tower is octagonal in form, and built entirely of granite. It is at once ornamental and solid in character, the vestibule being, moreover, fitted and arranged with that elegance which distinguishes many of the principal French lighthouses; indeed, the whole structure is so monumental that the tower alone absorbed the bequest of 300,000 francs. The staircase, leading from the ground floor to the lantern, is also of a highly decorative character, and numbers no less than 272 steps of 18 centimetres (0.6 foot) each, the total rise being, therefore, 49 metres (160 feet). The height of the tower is 63 metres (207 feet) above the ground, and the focal plane is 64 metres (210 feet) above high-water mark, the direct visibility or geographical range of the light

being, therefore, 25 nautical miles. In height the Penmarch tower exceeds some of the highest French lighthouse towers, and is only exceeded by the electric lighthouse tower of Barfleur, which measures 71 metres (233 feet). Between the parapet and the lantern the tower carries a siren worked by compressed air, and the lantern in which the optical apparatus is placed measures four metres and six metres (13 feet and 20 feet) in diameter and height, respectively. The lighthouse station comprises, besides the tower, the machine house for the steam engines, dynamos, air compressor and air-storage battery, and dwellings for the staff, all contained in the same enclosure, covering 80 by 60 metres, equal to about one and one-half acres. Outside, but close to the lighthouse enclosure, is situated a semaphore station for communication with men-of-war, these stations being placed all round the French coast and preferably in proximity to lighthouses.

The two engines, which, besides the dynamos, also drive the air compressor, are of the semi-portable Rouffet type, generally used by the French Lighthouse Department. At a pressure of six atmospheres they develop 12 effective horse-power each, and are provided with Monin's condensing arrangement, which consists in a system of metallic pipes surmounting the engines, and admits of 75 per cent of the vaporized water being recovered.

The engines drive both the two Blondel two-phase alternators and the air compressor by belt and through the same countershaft, this otherwise undesirable arrangement being necessitated by the contingencies of the siren service, which requires the engines always to be available for reloading the compressed-air battery.

For the purpose of feeding each lamp with 25 or 50 amperes, according to the intensity of beam required, the two alternators can be coupled mechanically, and the switchboard is so disposed that each lamp can be fed from two circuits of the same phase, each taken from one machine and coupled in parallel by the switchboard handles. To this end each lamp has its own voltmeter and amperemeter. Similarly, each lamp has an amperemeter placed in the lantern for the guidance of the man in charge.

The alternators are excited by small continuous-current machines, whose armatures are wound on the alternator shafts. The stator of each alternator has eight poles; the intensity of the magnetic field is about 4,000 c. g. s.; the resistance of each circuit is 0.213 ohm; the speed is 810 to 820 revolutions per minute, and the efficiency of the machines 70 to 75 per cent, according to the load. This efficiency is high, having regard to the small output (2.2 kilowatts each) and to the comparatively low speed, the latter having been adopted for safety's sake. Each of the reaction coils on the switchboard absorbs 20 to 25 watts (when the current is 25 amperes), which is insignificant in relation to the total output.—*London Engineering.*

LITERARY.

The ELECTRICAL REVIEW has received with the compliments of the author, Mr. Robert Hammond, a reprint of his paper, "The Cost of Generation and Distribution of Electrical Energy," read before the Institution of Electrical Engineers, London, March 24, 1898.

Walter A. Wyckoff, as a part of his sociological experiment, worked for seven weeks in a great reaper factory in Chicago. In the June *Scribner's* he shows what a great improvement is made in men by steady work and steady wages. Mr. Wyckoff's job was the loading of reaper tongues on cars.

Cassier's Magazine for June is devoted almost entirely to naval subjects. The heads of some of these articles are as follows: "The Ram in Modern War Fleets," "Modern Ships of War," "The Spanish Armada," "Some Practical Notes on American Battle-Ships," "Battle-Ships of the United States Navy," "Mechanism of Modern Naval War."

A second and enlarged edition of "Gas, Gasoline and Oil Engines," by G. D. Hiscox, has been issued. The whole work has been revised and improved in many ways and now consists of 384 large octavo pages illustrated by 270 engravings. The book is designed for the general information of every one interested in this sort of motive power, and is the only American book on the subject. The price remains the same as the previous edition, $2.50, for which the book will be sent free by the Electrical Review Publishing Company, Times Building, New York.

The new issue of *Collier's Weekly* has a spirited double-page picture, by Gilbert Gaul, symbolical of the present "Rally 'Round the Flag." Many American types are portrayed—the farmer, the mechanic, the merchant and his clerk, northwestern cowboys, southern planters, miners from the mountains, fishermen from the seashore, lumbermen from the forests—whites and blacks, rich and poor, and conspicuous among them the veteran wearers of the blue and the gray. It is a picture that indicates the final and entire obliteration of sectional lines. The frontispiece is "The Standard Bearer," a drawing from life, by F. C. Yohn, of the color-sergeant of one of the cavalry regiments of the regular army—one of the brave, powerful, determined men from whom alone the color-bearers of the army are selected.

"THE STORAGE BATTERY, A PRACTICAL TREATISE ON THE CONSTRUCTION, THEORY AND USE OF SECONDARY BATTERIES." By Augustus Treadwell, Jr., E. E. Cloth, 257 pages, 117 illustrations. Price, $1.75. Sent postage free on receipt of price by the Electrical Review Publishing Company, Times Building, New York.

The author has succeeded in compiling and conveniently arranging a valuable collection of data and reliable discharge curves, which will prove useful, not only to the student and manufacturer, but also to every one interested in storage batteries. A chapter is devoted to the chemistry of secondary batteries and includes the latest and most generally accepted theory concerning the chemical reactions taking place in the storage cell. This chapter was submitted to and approved by a prominent chemist. The book is well prepared and well printed, and should prove to be a valuable treatise for the classes it is designed to reach.

Forthcoming Electrical Meetings and Conventions.

National Electric Light Association, twenty-first convention, Auditorium Hotel, Chicago, June 7, 8 and 9.

Northwestern Electrical Association, annual convention on lake steamer from Chicago to Duluth, June 10, 11, 12, 13 and 14.

American Institute of Electrical Engineers, general meeting, Omaha, Neb., beginning June 27.

Canadian Electrical Association, annual convention, Montreal, June 28, 29 and 30.

Philadelphia Electrical Exposition, Philadelphia, will be held during the entire month of June.

Trans-Mississippi and International Exposition, Omaha, Neb., June 1 to November 1.

The Association of Railway Telegraph Superintendents, annual convention, Omaha, Neb., June 15.

Condenser Electro-Magnets.

During the past three years an interference contest has been pending in the United States Patent Office between one of the patents of the American Bell Telephone Company and an application for patent of Mr. John T. Williams, the inventor of the Portelectric carrier system, the subject of which is condenser electro-magnets, or electro-magnets embodying in the same structure an electrical condenser. In this device the winding of the magnet forms one electrode or plate of the condenser, while another interwound conductor forms the other electrode, the insulating material of the wires serving as the dielectric. The purpose of this invention is to suppress the evil effects of self-induction in the magnet winding, and so quicken or sharpen the response of the armature, and is especially effective on alternating or rapidly-interrupted current circuits. The case was recently finally decided in favor of Mr. Williams.

Mr. William A. Rosenbaum, of New York, appeared for Williams, while Mr. W. W. Swan, of Boston, and Messrs. Pollok & Mauro, of Washington, D. C., represented the Bell company.

Chicago Volunteer Electrical Corps.

Under the direction of Col. Eugene Griffin, of New York, a committee of the Chicago Electrical Association is sending out enlistment blanks to the electrical fraternity in that locality, calling upon them to take service in the volunteer electrical corps of the army. Any one capable of being converted into a military engineer is desired as a recruit. The returns so far have been very satisfactory.

New York Electrical Society.

At the 187th meeting of the New York Electrical Society, held at Madison Square Garden on May 12, there were 103 members elected. Among these were the following: John Jacob Astor, George W. Vanderbilt, Dr. Chauncey M. Depew, C. O. Baker, Jr., and Garrett A. Hobart, Jr.

KIND WORDS.

NECESSARY FOR ELECTRICAL HOUSEKEEPING.

TO THE EDITOR OF ELECTRICAL REVIEW:

Find enclosed draft of $3 for subscription to the ELECTRICAL REVIEW. We could not keep house without it.

McCARTNEY BROTHERS.

May 14.

INSULATION AND CONDUCTION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MARCH 23, 1898, BY REGINALD A. FESSENDEN.

(Continued from page 311.)

It is this absorption and the consequent losses which make glass useless as an insulator against high alternating-current voltages. In some experiments made by Messrs. Stanley and Chesney, which were shown me, the glass plates of the condenser when on an alternating-current voltage (though thick enough to have stood 10 times the direct-current voltage) after a few moments got hot, sparks could be seen passing inside the glass, and the plates finally broke down. Glass is not homogenous, as it is made up of a number of substances, some much better conductors than others, and of different capacities and all stirred together but not dissolved. This is shown by the care which has to be used in getting glass homogenous enough for optical purposes, if even having, as has been told me by Mr. Brashear, to be kept perfectly horizontal when annealing, as the heavier parts tend so much to sink down to the bottom, even when the glass is only plastic, that the only way to do is to keep the levels of different density parallel to the surface of the disk, so that their effect on the light will be as equal as possible for all rays. Otherwise one side of the lens would be of heavy glass and the other light, while at present it is so arranged that one face is dense and the other light. Mica is much less objectionable, especially if its cracks are filled up and it is well dried. Paraffin, when properly treated, makes very good condensers. The old method of piling together pieces of paraffin paper and tin-foil and then pressing them, left much air and moisture inside. This produced large electrical absorption and gave large capacity. Messrs. Hutin and La Blanche were the first to discover that good condensers could be made by heating such condensers till the moisture and air were expelled. Their results* showed that the specific inductive capacity of this more homogenous dielectric could be reduced from 8 to 2.5. I have myself found it come down as low as 2. They then found that the same results could be obtained by heating the paper before making up the condenser. Since then, this method of forming condensers by heating them to expel moisture, air and acid has been used quite generally, with some modifications and improvements resulting in a shortening of the process.

It may be said as a general rule that the capacity of all substances showing absorption may be reduced by this treatment, if the heating be kept up long enough. A great many oils, for instance, are given high capacities, but I have found that in many cases this can be greatly reduced by this method, and that the slight remaining excess of K over that called for by Maxwell's theory can be almost entirely removed by removing the free fatty acids, mucins, etc. Oils tested by me were olive, castor, linseed and cottonseed. All these have very high insulation resistance and low specific capacity when so treated and purified, but they soon lose this again when exposed to air. It is evident, therefore, that the anomalous results obtained by Hopkinson and others were due, in some cases at least, to impure material, and such results must be considered as forming a strong proof of the correctness of Maxwell's theory.*

But when the substances are not themselves solid, but viscous, they must have a mechanical backing. For this, pure cellulose is generally used. Pure cellulose contains some loosely combined moisture. Consequently it can exist in two states. Dried below 100 degrees centigrade it decreases its specific inductive capacity very much, and has very high resistance and is flexible. Kept above 100 degrees centigrade for any length of time it loses some of its combined water, has a much higher ohmic resistance and its specific inductive capacity sinks to 1.9 or 2. It however becomes very brittle, and even though the temperature be only a few degrees above 100 centigrade it finally can not be bent without breaking. (This brittleness must be carefully distinguished from the so-called rottenness which cotton fabrics get when dipped in linseed oil and dried. The fact that cotton tears easily in such a condition is due to the same cause as makes a wire mosquito netting tear when painted; i. e., the fibers are stuck fast by the varnish and can not help one another. This can be proven by removing the dried oil when the fiber will be found to have nearly its original strength.) In this condition it is best suited for making condensers. The paraffin itself is greatly improved, as was pointed out by Huttin and Lablanc, by heating to about 140 centigrade. Three hours' heating I have found satisfactory. The dried paper immediately on removal from the oven is plunged into the hot paraffin, so as to protect it from absorbing moisture. The condenser is then made up and boiled, so as to remove the air, for several hours. This boiling method was described in a recent patent as a novelty, but it was used by Mr. Chesney at Pittsfield in 1891.

A condenser so made, if perfectly pure cellulose is used—perfectly pure paper is used in practice—and with pure paraffin, will stand 250 volts per thousandth of an inch when the dielectric is less than .01 inch, and at a higher rate for greater thicknesses, when the effect of small defects in one sheet of paper is not so serious.

Practically the same remarks apply to the making of induction coils. Here, however, we meet with the great difficulty that the paraffin in cooling is sure to shrink, and will leave hollows inside. The way to get over this is to construct the coil so that when cooling the shrinkage will take place outside, just as if one were making a casting of some metal having great contraction. The coefficient of adhesion also should be less between the walls of the mould and paraffin than between the wire and paraffin; also the outside should never be let harden first, as then, of course, a hollow space is left inside. Another precaution is to expel all gases by heating the paraffin for some time above the temperature at which the coils are to be boiled. The coils should be boiled above 100 degrees centigrade for some hours to drive off the loosely combined water. This destroys the mechanical strength of the cellulose, but, as the whole coil forms a solid mass, this is of no great consequence.

Silk should never be used where high insulation is required, as pure cellulose dry and boiled in paraffin is so much superior to it that there is no comparison. With pure cellulose, coils with only 1,700 feet of wire per inch of spark stand perfectly; i. e., the spark may be five times longer than the coil. In ordinary use, coils having a spark length three and one-third times that of the coil have been run for long periods with no breakdowns.

(To be continued.)

EXHIBIT OF THE WESTON ELECTRICAL INSTRUMENT COMPANY, AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

* *La Lumiere Elec.*, July 25, 1891.

*A rule connecting this effect with the sign of the Kerr's electro-static optical effect has been given by the writer.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

ANNUAL BUSINESS MEETING AND ELECTION OF OFFICERS.

The annual business meeting of the Institute was held at 12 West Thirty-first street, New York city, on May 17. The annual reports were read, and, after a recess of one hour, Messrs. Townsend Wolcott and J. P. Wintringham, tellers, reported the result of the annual election as follows: President, Arthur E. Kennelly; vice-presidents, Robert B. Owens, William Stanley, Cary T. Hutchinson; managers, Herbert Lloyd, Samuel Sheldon, George F. Sever, Charles P. Steinmetz; secretary, Ralph W. Pope; treasurer, George A. Hamilton. At the meeting of the executive committee in the afternoon 10 associate members were elected. The following associate members were transferred to membership: Edward Burch, electrical engineer, Twin City Rapid Transit Company, Minneapolis, Minn.; G. A. Redman, general superintendent electrical department Brush Electric Light Company, and Rochester Gas and Electric Company, Rochester, N. Y.; L. S. Boggs, Pioneer Electric Company, Ogden, Utah; Gustave J. Fischer, engineer for tramway construction, Public Works Department, Sydney, N. S. W.; James B. Scott, electrician and mechanical engineer, 227 East German street, Baltimore, Md.

The treasurer's report showed that the Institute is in a healthy financial condition. The total membership on April 30 was 1,098, made up as follows: Honorary members, 2; members, 352; associate members, 744. This is a net gain of 25 over the previous year. There were 9 deaths and 20 resignations during the past year. The next general meeting of the Institute will open at Omaha, Neb., on June 27.

Philadelphia District Telegraph Company.

At the annual meeting of the American District Telegraph Company, of Philadelphia, Pa., the following officers were elected: president, Edward J. Mathews; vice-president, William H. Baker; vice-president and general manager, Charles C. Adams; secretary and treasurer, William L. Fry; directors, Charles C. Adams, William H. Baker, E. C. Bradley, A. B. Chandler, George G. Glenn, Edward J. Mathews, E. C. Platt and W. L. Stanger.

A NOVEL FORM OF THERMO-ELECTRIC BATTERY.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, APRIL 27, 1898, BY C. J. REED.

(*Continued from page 295.*)

The experiment may be varied by using two rods in the form of B. In this experiment there is no evidence of electro motive force when the rods are in a vertical position, so that both are equally heated by the electrolyte, as shown in Fig. 3. Upon inclining the rods so that one barely makes contact with the electrolyte, while the other extends about one-fourth of an inch below the surface, as shown in Fig. 4, the rods acquire a considerable difference in temperature, which is clearly indicated to the eye, one being distinctly red and the other black. At the same time an electromotive force is developed, which in some experiments has reached as high as 0.6 volt. Upon reversing the position of the rods, so that the hot one becomes cold and the cold one hot, the direction of the electro-motive force slowly reverses. This reversal I have found may be repeated indefinitely, provided the other conditions of the experiment are maintained.

Rods of carbon, copper and various other metals may be substituted for the iron rods, and other electrolytes substituted for the caustic alkali. In all cases similar results, differing only in degree, are obtained. Many of these results are highly interesting and will be described later in detail.

The changes in the constitution of the alkali hydrate, which take place during its gradual dehydration, have not yet been definitely determined. It is quite certain that these changes have a marked effect on the thermo-electric power of the cell. If any current be allowed to flow, the electrolytic action of the current immediately causes the formation of oxide of iron at one electrode, and the reduction of previously existing oxide of iron at the other electrode. This necessarily produces a change of chemical composition in the electrolyte adjacent to the electrodes or on the surface of the electrodes themselves.

As long as oxide of iron remains dissolved in the electrolyte and in contact with the electrodes in sufficient quantity to transmit the current, the electrolytic action will neither absorb nor evolve energy, since the amount of iron oxidized at one electrode will be equal to the amount reduced at the other. The resistance of the electrolyte as a conductor only will cause a fall of the potential difference on closed circuit. If no oxide of iron is present in a dissolved condition in the electrolyte, and if there is none on the surface of the hydrogen electrode available for reduction, the current can no longer flow without reducing some other constituent of the electrolyte, such as sodium or hydrogen. In other words, a counter-electro-motive force or "polarization" ensues.

It was found by Deville* that sodium hydrate does not decompose at any temperature into water and sodium oxide, but at about 1,100 degrees per centigrade it decomposes into sodium, hydrogen and oxygen. If, therefore, a condition should ensue, in which no oxide of iron is available for reduction while the current continues to flow and ferric oxide continues to form at the oxygen electrode, the electro-chemical

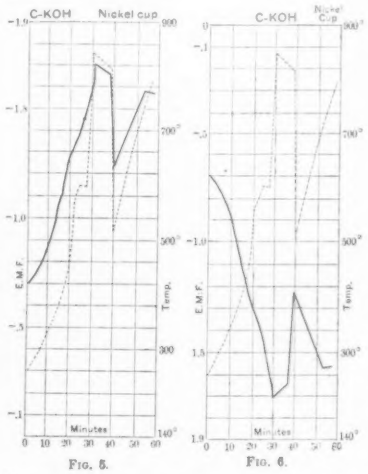


FIG. 5. FIG. 6.

DIAGRAMS ILLUSTRATING "A NOVEL FORM OF THERMO-ELECTRIC BATTERY."

reaction would be $3\,Na\,OH + 2\,Fe = Fe_2O_3 + 3\,Na + 3\,H$.

This reaction could take place electrolytically at ordinary temperatures by the absorption of 115,000 calories, corresponding to a counter electro-motive force of $\frac{115{,}000}{6 \times 23{,}240} = 0.82$ volt.

At the temperature of 500 degrees centigrade, at which the thermo-electro motive force of the cell is about one volt, the reaction would absorb approximately, 72,000 calories, corresponding to a counter-electro-motive force of $\frac{72{,}000}{6 \times 23{,}240} = 0.52$ volt.

There is reason to believe that this condition of the electrolyte does actually ensue at a certain stage of the experiment when the circuit is closed, and under certain conditions metallic sodium may be evolved in considerable quantities at the inner surface of the cup. The maximum quantity of iron that can be dissolved in the fused caustic alkali is very small, and this appears to be held in solution only while there is present more water than corresponds to the formula for the alkali hydrate. This excess of water is driven off very slowly, the last trace leaving only at a temperature above 500 degrees centigrade.

*Comptes Rendus, xlv., 859.

Liebenow and Strasser* found that when the alkali, fused in an iron cup, reaches a temperature of about 550 degrees centigrade after prolonged heating, it undergoes a radical change in properties, changing color from green to dark brown and simultaneously absorbing heat and causing its own temperature to be temporarily reduced. With this change in the electrolyte the electro-motive force undergoes a sudden change of about one volt.

The absorption of heat and consequent reduction of temperature can be accounted for only by a chemical change in the electrolyte, which causes the heat to become latent. Such a reaction may be explained on the supposition that the electrolyte changes at this temperature from an aqueous solution to a dehydrated fused electrolyte. While water is present the iron probably remains in solution as ferric acid (the highest known oxide of iron), in combination with the alkali as potassium or sodium ferrate, which, in the highly concentrated solution, has a green color if any sulphur is present. When the water which holds this salt in solution is finally driven out, the ferric acid, being insoluble in the dehydrated alkali hydrate, is decomposed into ferric oxide, potassic oxide and oxygen, the reaction being $2\,K_2FeO_4 = 2\,K_2O + Fe_2O_3 + 3\,O$.

The insoluble ferric oxide precipitated in the solid state by this reaction gives the dark brown color to the mass, which was observed by Liebenow and Strasser. This precipitate is found disseminated through the solidified hydrate on cooling. The dissociation of the ferric acid should be accompanied by the absorption of considerable heat—probably at that temperature about 150,000 calories. This would be sufficient to account for the remarkable fall of temperatures, observed by Liebenow and Strasser to accompany the change of color from green to brown. A further examination of the results obtained by these investigators reveals the fact that this fall of temperature occurred only in those experiments in which either iron or nickel was present in the electrolyte.

1. A dielectric, as in Fig. 6, containing conducting particles of water, for instance, may be considered as an arrangement of condensers and resistances in series and shunt with each other. Two cases, shown in Figs. 7 and 8, are worked out, and Fig. 9 gives the curve of charge in the cases of Fig. 7; E is the voltage on the condenser part, and E′ that on the condenser and resistance.

2. A condenser can show large residual charge, though its true ohmic resistance is infinite.

3. With dielectrics showing absorption, there will be found some discharge time at which the amount of discharge will be constant at all temperatures.

4. Why in some tests insulation seems to be lower with higher voltages.

5. Why the presence of conducting particles increases apparent capacity.

6. That to get true ohmic resistance of most dielectrics, voltage must be kept on for a long time, even for days.

7. Why Siemens's method of taking the rate of loss of charge by electrometer does not give correct results.

8. That specific inductive capacity of such dielectrics can only be determined by rapidly alternating currents. This possibly explains an effect noticed by the writer many years ago; i. e., that an alternating-current static wattmeter immersed in water did not give anything like the torque it should have if the true value of K for water were 80.

9. The importance of getting out the last traces of water in gutta-percha and paper when used for cables.

As mentioned, this author considered a simple case of Maxwell's general theory and proved the above results by making actual measurements on condensers and resistances connected up so as to correspond to a simple case of a dielectric of high resistance with conducting particles in it. This paper should be read by all electricians, especially those concerned with cable work. I would like to speak of this subject more in detail, but for lack of time will only add that most of the conclusions in that paper have been confirmed by me, and that some which had been arrived at independently were seen to be in perfect agreement.

(*To be continued.*)

*Zeitschrift fur Elektrochemie, February 20, 1897.

The Press Censor at Key West.

The government official at Key West, who passes upon all messages sent from that point, is kept pretty busy watching the dispatches of the bright newspaper men there. The sailing of Admiral Sampson's fleet for Porto Rico was an event that the correspondents tried to get to their newspapers, but without avail. One bright newspaper man thought his scheme would work. He filed a message reading: "The newspaper fleet sailed for Porto Rico to-day." Later in the day, he filed the following message: "Correction—Omit second word in former dispatch." This would have made the first dispatch say that "the fleet sailed for Porto Rico to-day," which was the news he desired to get through. When he handed in the second dispatch, the censor handed back his first dispatch, on which was written: "All fleets look alike to me." The correspondent gave it up.

While the correspondents are naturally most desirous of serving the journals they represent, they acknowledge that the censor is a very courteous and capable gentleman, and have discovered that plain, straightforward messages get better treatment at his hands than any other kind.

A New Thermopile.

The radiometer of Crookes, the micro-radiometer of Boys and the splendid work which Langley has done with his bolometer, have almost made us forget the delicate thermopile of Melloni, which was indispensable on any lecture table twenty years ago, says London *Engineering*. There is one objection to Melloni's pile. Though one can not call it massive, its heat capacity is sufficiently large that it does not respond with promptitude to rapid minute changes in temperature. With the antimony-bismuth pile no great improvement could be realized, since these metals can not be drawn out to fine wires. But H. Rubens has obtained excellent results with iron-constantan coup'es, although their electro-motive force is only half that of the Melloni's junction—53 against 100 microvolts per degree centigrade. The pile is contained in a brass cylinder provided with two longitudinal slots 180 degrees apart, over which a sleeve, with two slots, 90 degrees apart, is fitted; only one of the slots is therefore open at the time. Inside the cylinder is an ebonite frame with two parallel rows each of ten pins, between which the wires are stretched in a continuous zig-zag line. The distance between the two rows is 10 millimetres, between two pins of the same row two millimetres; the wires have a thickness of 0.1 (iron) and 0.15 millimetres (constantan). The pins serve simply as holders, not as thermo-junctions. Each of the 20 wires consists of halves of the different substances, and there are even junctions in the centers between the row of pins and odd junctions near the pins. The junctions are hammered out to very fine little disks. Special diaphragms allow the heat rays to fall on the even junctions only. The electro-motive force of the 20 junctions is 0.00106 volt. With an internal resistance of 3.5 ohms and five ohms in the galvanometer, a difference of one degree centigrade would, in Rubens's pile, give a deflection of 3,600 millimetres, so that the ten-millionth part of a degree centigrade can easily be estimated. The pile is, therefore, not inferior in sensitiveness to a bolometer, and the advantage over the latter is that the currents are so weak that no disturbance from the heated air round the wires can arise, which may occur in the case of a bolometer. The new thermopile can also be inserted in the eye-piece of a spectrometer. Professor Rubens describes this apparatus in the *Zeitschrift für Instrumentenkunde*.

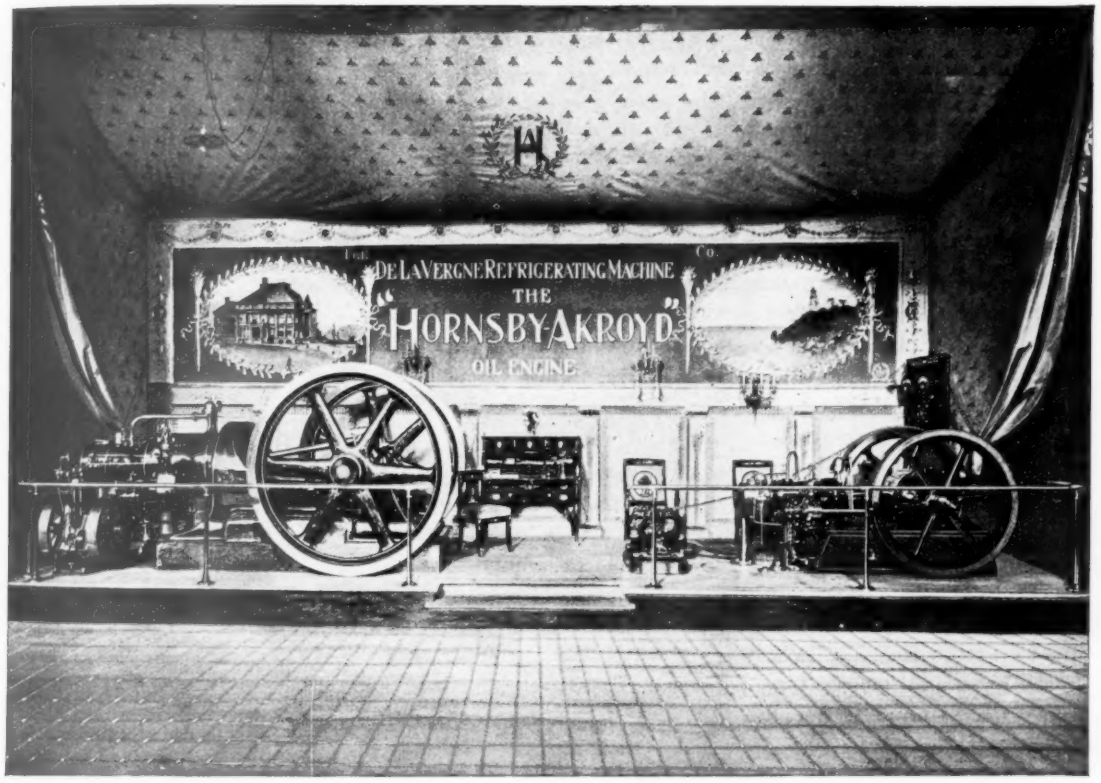


EXHIBIT OF THE DE LAVERGNE REFRIGERATING MACHINE COMPANY, SHOWING HORNSBY-AKROYD OIL ENGINES AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

The Cicero, Ill., Light, Heat and Power Company will commence, in a few days, to rebuild their power-house, which was destroyed by fire.

An Electrical Man Fools The Spaniards.

Nearly all the newspapers of Madrid, according to an exchange, published on April 26 an inspired paragraph to the effect that Senor Sagasta had received a dispatch in which "a notable German statesman, Senator Severin, expressed his sympathy with the Spanish nation." The text of the despatch was:

"Germany sides with the just cause of Spain.

"We pray that fortune may accompany her armies, and that new laurels be added to the heroic and glorious history of Charles V.

"SEVERIN, Senator, Berlin."

El Nacional explained on April 28 that the "notable German statesman Severin" was no other person than the head of the firm of Severin Senator, of Berlin, manufacturers of electric supplies for war and merchant vessels, "who delicately offer their goods to Spain just in the same way as they would to the United States were it not because this nation has all of these things at home. This is the kind of allies that Spain has!"

The contract for the construction of the Buffalo, Hamburg & Aurora, N. Y., Railway has been awarded to Crage & Tench, of Buffalo. The power-house and Hamburg division will be built first. A large force of men will be put to work grading the roadbed this week.

THE ELECTRICAL SHOW.

Features of the Third Week.

GOVERNOR HOGG, OF TEXAS, AMONG THE VISITORS — LIEUTENANT JENKINS'S SWORD AND RELICS FROM THE "MAINE" ON EXHIBITION—A MILWAUKEE THEATER CONNECTED WITH THE SHOW BY TELEPHONE—THE ELECTRIC MOTOR AND ENGINE EXHIBITS PARTICULARLY INTERESTING AND UP TO DATE.

The third week of the Electrical Show closed in a satisfactory manner, in spite of the inclement weather. The crowds were large, and a number of special features proved attractive.

On Monday evening a phonograph entertainment was given in the concert hall and this was followed by an exhibition of Edison's projectoscope.

On Wednesday evening ex-Governor Hogg, of Texas, accompanied by a party of friends, was initiated in the mysteries of the various exhibits by president C. O. Baker, Jr.

The 188th meeting of the New York Electrical Society was held in the concert hall, Madison Square Garden, on Thursday at 8.30 P. M. Prof. I. Fujioka delivered a lecture on "Electrical Developments in Tokyo City and the Kingdom of Japan." The lecture was profusely illustrated by lantern slides. Professor Fujioka is a leading authority in Japan on electrical subjects, and a great admirer of American methods and progress. His audience was greatly interested and pleased with his explanation of the subject in hand.

Gen. E. S. Greeley's golden telegraph key, which has become historical through its use in opening many expositions, from the time of the World's Fair up to the present Electrical Show, is now on view in a glass case in the headquarters of the New York Electrical Society. Owing to its intrinsic and historical value, the key is under guard at all times.

The following meetings of the National Association of Stationary Engineers were held during the week: May 16, No. 31, New York, and Nos. 10 and 1, New Jersey; May 17, No. 42, New York; May 18, No. 39, New

(Continued on page 338.)

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

TIMES BUILDING, 41 PARK ROW,
P. O. BOX 2330. NEW YORK.

NEW YORK, MAY 25, 1898.

CHARLES W. PRICE, - - - - - - - EDITOR.
STEPHEN L. COLES, - - ASSOCIATE EDITOR.
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REGISTERED CABLE ADDRESS:
"ELECTVIEW," - - - NEW YORK.
TELEPHONE CALL, 1546 "CORTLANDT."

NEW YORK OFFICE:
RUSSELL HOWLAND, REPRESENTATIVE,
Times Building, 41 Park Row.

WESTERN OFFICE:
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1627 Monadnock Block, CHICAGO.
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LONDON OFFICE:
HENRY W. HALL, - - REPRESENTATIVE,
42 Old Broad Street, LONDON, E. C.
News, Subscriptions and Advertisements.

Subscription to the ELECTRICAL REVIEW.

One Year, United States and Canada, - - $3.00
One Year, Foreign Countries, - - - - 5.00
Single Copies, - - - - - - - - - .10
Copies can only be supplied for one year back at 25 cents each.

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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A strict censorship is now exercised over all the foreign cable lines entering the United States, in order that news of our army and navy movements may not reach Madrid. The officers of these cable companies are to be congratulated on the cheerful patriotism with which they have accepted and obeyed this order.

We are glad to note that the House of Representatives has passed a bill appointing three commissioners to investigate necessary revision of the statutes relating to patents, trade and other marks, and trade and commercial names. The commissioners are to be named by the President, and are to report to Congress such proposed revisions as may appear necessary to make our laws conform to recent international agreements.

We commend to the attention of the telegraph fraternity an intensely interesting article by David Homer Bates in the current *Harper's Magazine*. The story tells how three Union telegraph operators unraveled an intercepted cipher dispatch addressed to Judah P. Benjamin, of the Confederate cabinet. There were no more trusted and faithful employés of the government during the Civil War than the military telegraphers, and in the present war with Spain a new generation of their craft will doubtless have an opportunity of displaying the same qualities and winning similar laurels.

The present Electrical Exhibition in New York city emphasizes the thought that the electric current is the most pliable and universal power agent now in the service of man. Steam has its own field, but the field has clearly defined limits. Compressed air is useful in its way, but the path is narrow and short. Mechanical transmission of power occupies but a small corner. But electricity is universal and can enter into every one of the old fields, while occupying distinctive territory of its own. The Electrical Exhibition brings out this truth most forcibly. It may fairly be said that the electric current can be used for almost any purpose, industrially as well as in the humbler purposes of the household. It enters into our daily life more and more, and we grow with it so naturally that full appreciation of its wonderful progress and adaptability only strike us when we see its widespread influence displayed at one of these exhibitions.

ELECTRICITY IN WARFARE.

Our London namesake in a recent issue quoted about two columns of matter from the ELECTRICAL REVIEW and other American electrical journals, referring to the part electrical men and manufacturers took in our preparations for the war with Spain. Our London contemporary referred to the establishment of the Electrical Engineers' Volunteer Corps in England about a year ago, and says that "since then there has been much organization work to be done, but though this is in an advanced state, we should question whether the corps would be ready for the field within a few weeks if required. * * * Over seven years ago the attention of the United States was forcibly drawn to the possibility of forming such a corps, and if advantage had been taken of the warning, the States would probably by this time have possessed a well equipped body ready for all emergencies. * * * In the matter of electrical engineer volunteers, the States may perhaps regret that steps were not taken earlier, instead of waiting for us to set the example."

While we do not lightly regard the advice and opinions of our London namesake, and are bound to agree with it that a thoroughly organized volunteer electrical corps would have been a great advantage to us in the present war, nevertheless, we think that our British cousins are not perfectly familiar with the American way of doing things. Emergency work is what our electrical men are trained to from the beginning, and when the emergency arose in the present case they were found ready and willing, and proceeded promptly to perform the tasks assigned to them, the organization being perfected while they were at work. This is not the time for a story to be written about the important things our volunteer electrical corps has done. When that story is written, and it will be, we think our British cousins will open their eyes in astonishment. As a possibility of the future, provided the British-American alliance which is now hinted at is consummated, our electrical volunteer corps will doubtless profit by the experience gained in the organization of the British Volunteer Electrical Engineer Corps.

ELECTRIC POWER STATION TESTS BY STUDENTS.

About 100 students from the engineering laboratory of the Massachusetts Institute of Technology, at Boston, recently made a test of the new electric power plant of the Boston Elevated Railroad at Harvard square, Cambridge, Mass. The test was 48 hours long, and was divided into four shifts of 12 hours each. Boilers, engines, dynamos and air pumps were all considered. Among the results obtained are the evaporation of the boilers per pound of coal; the steam per horse-power per hour used by the engines; the coal per electric horse-power output per hour, and the condensing water required for the horse-power.

This plant represents the latest development of electric power work. There are three engines of about 1,800 horse-power each and three batteries of boilers. The gases from the boilers pass through an economizer on the way to the stack. The Babcock & Wilcox boilers, with extension furnaces, are fed by power pumps driven by electric motors.

The engines are of the E. P. Allis make, compound, each of about 1,800 horse-power. The steam is brought to a high-pressure cylinder through a separator, and the piping is beneath the engine and arranged so that either cylinder may be run at high pressure. The air pumps are of the Allis jet condensing type, run by a separate engine.

This test was made as complete as possible. A weir was built to measure the condensing water discharged from the jet condensers into the river. It was about three feet wide, and at times had about a foot of water flowing over it. This test has been of immense value to the students, as it gives them an opportunity to apply on a large scale the principles they have already learned in the laboratory. A large amount of useful data was also obtained, both for the road and for the students.

Wall Street and the Electrical Stock Market.

The stock market of the past week has been mainly professional. The exhibit made by our statistics of exports, as well as the manifold indications of great agricultural prosperity, have made capitalists desirous of buying stocks in expectation of a substantial appreciation in values. Quotations have been manipulated upward all the week, but the general public has not been a buyer of securities. The reason for the reluctance on the part of the latter to invest or speculate at the moment is in a great measure sentimental, the uncertainty attending the movements of the enemy's fleet and ours being the deterent factor. With the Spanish fleet accounted for, Wall Street expects a sharp bull movement to set in.

General Electric was much less active than last week. The stock opened at 35½, but sold up to 36⅝ on the announcement that favorable decisions had been rendered in the motor suspension and series parallel controller patent cases. The debentures 5's sold at 102½ to 103.

Western Union which opened at 88¾, advanced 2½ points during the week on buying, based upon the increase in earnings experienced by the company since the war began, and due principally to the unprecedented press business.

North American was quiet and steady at 5¾ to 5⅞. American Telegraph and Cable was traded in but once, 30 shares changing hands at 93. A small lot of Edison of New York sold at 125. The earnings of the company, inclusive of high-tension system, for the month of April were, gross $260,609, an increase of $54,466 and net $120,796, an increase of $19,952 over last year. For the four months the gross earnings were $1,079,772, an increase of $212,656, while the net were $498,983, an increase of $73,168 over the corresponding period last year.

Trading in electrical stocks on the Boston Exchange during the week, when compared with the activity which has prevailed for some time past, was dull and featureless. American Bell Telephone opened at 259, sold up to 261 and reacted to 258; Erie Telephone opened at 68, advanced to 69½, subsequently losing ½; New England ranged between 125 and 126; Westinghouse declined from 22½ bid, offered at 24 early in the week, to 20½@21½, respectively. The preferred stock sold at 52 and 52½. The actual number of electrical shares traded in during the week did not exceed 225.

On the Philadelphia Exchange dealings were more active. Electric Storage Battery common sold at 21¾; the preferred was quoted at 25 @ 25½, with one sale at 24¾; Pennsylvania Heat, Light and Power advanced from an opening of 12⅝ to 13⅞ at the close on moderately heavy dealings. RAY.

Wall Street, May 21.

PERSONAL.

Mr. Frank Laughlin, of the Phœnix Carbon Manufacturing Company, of Pittsburgh, visited New York city last week.

Mr. W. C. Ballda, of the Utica Electrical Supply and Manufacturing Company, Utica, N. Y., visited New York city last week.

Mr. W. B. Potter, engineer of the General Electric Company's railway department, will be absent in Europe about six or eight weeks.

Prof. S. Homer Woodbridge, the sanitary engineer, will hereafter be associated with the electrical engineering work of Stone & Webster, Boston.

The estate of Mrs. Julia W. James, of Boston, divided by her will between the Museum of Fine Arts and the Massachusetts Institute of Technology, amounts to over $500,000.

Capt. Frank S. De Ronde has received leave of absence from the Standard Paint Company, and has enlisted for the war. He is now in camp at Sea Girt, N. J., in command of the Englewood company.

First Vice-President Eugene Griffin, of the General Electric Company, has been appointed colonel of the First Regiment of Volunteer Engineers. Colonel Griffin is a retired officer of the regular army, in which his rank was captain of engineers.

Mr. John Rice, who is so well and favorably known to the carbon consuming trade as a popular salesman of the National Carbon Company, of Cleveland, Ohio, severed his connection with that company on the 15th inst., and has accepted a similar position with the Phœnix Carbon Manufacturing Company, of St. Louis.

Mr. William Cantrell returned last week from Ponce, Porto Rico. Mr. Cantrell is an Englishman and has spent the past 14 months as chief electrician of the Ponce Electric Light Company. He was in that city during the bombardment of San Juan by Admiral Sampson's fleet. Mr. Cantrell is of the opinion that if the United States forces take San Juan a large number of the Spanish soldiers will welcome them with cheers instead of bullets.

Mr. Gardiner C. Sims, who is well known in the electrical fraternity and who recently offered his valuable services to the Navy Department, has been assigned to the "Vulcan," with the rank of lieutenant. The "Vulcan" has been thoroughly equipped as a repair ship, is fitted with a full complement of stores and is manned by a crew of skilled machinists.

Mr. Benjamin F. Montgomery has been appointed a captain in the Signal Corps of the United States Army. Mr. Montgomery is well known among the electrical fraternity, as he has been a telegraph operator at the Executive Mansion in Washington for many years. Recently he has had charge of the President's war telegraph office at the White House. Mr. Montgomery also served seven years in the Signal Service. It is expected that he will be detached for special duty at the White House during the war.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

As has already been announced in the ELECTRICAL REVIEW, the twenty-first convention of the National Electric Light Association will be held at the Auditorium Hotel, Chicago, June 7, 8 and 9.

A communication from president Samuel Insull informs the ELECTRICAL REVIEW that a very large attendance, especially of central station managers, may be expected.

A programme of the proceedings, as far as decided upon, appeared in the ELECTRICAL REVIEW last week.

The officers of the Association are as follows: Mr. Samuel Insull, president; Mr. A. M. Young, first vice-president; Mr. George R. Stetson, second vice-president; Mr. George F. Porter, secretary and treasurer; Mr. C. O. Baker, Jr., master of transportation, and Messrs. W. R. Gardener, G. A. Redman, H. A. Wagner, John A. Seely, A. J. De Camp, E. H. Stevens, F. A. Gilbert, W. W. Bean, W. McLea Walbank, executive committee.

They have a neat scheme in Torquay, England, in the way of street lighting. On each arc lamp-post are placed two incandescent lamps, which come into operation automatically if the arc lamp circuit goes wrong. Thus the district served by the arcs could not be void of light unless the whole central station goes up in the air.

Planked Shad at Gloucester.

A select few electrical gentlemen received official order No. 5 from Philadelphia, signed by Charles E. Trump, Major-General, commanding attacking party, to assemble at Philadelphia on Wednesday, May 18, to attack the advancing foe, known as Shad, at the Hon. W. J. Thompson's Washington Park, just below Gloucester. The gallant New York electricians responded in force, and bravely fought until the enemy, like the Spanish fleet after Dewey got through with it at Manila, was entirely destroyed.

The shad, it might be said, were never better, and at this point are hauled in by net-loads of a thousand a haul, and the privileged visitors to that section became acquainted with the delicious taste of the shad planked immediately after its capture. The party was shown around Washington Park by Mr. William J. Thompson, who is well known in electric railway circles, and enjoyed a careful inspection of the famous electric fountain at this point. The fountain is entirely unique, and has proved to be one of the greatest attractions for trolley parties ever presented in this country. In its center, apparently in the midst of the water, is a movable platform on which dancers are to be seen, the water and draperies constantly changing hue by means of the Colt focusing lamps beneath. The electrical people interested in attractions for parks and street railway termini should see this fountain.

The New York invaders were able to return home the next day, hoping, if they ever get an appetite again, to be privileged to participate in another shad dinner on the banks of the Delaware.

LATE NEWS.

The earnings for April of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1898.	1897.	Increase
Gross	$260,609 04	$206,142 93	$54,466 11
Net	120,796 86	100,844 50	19,952 36
Gross, four months	$1,079,772 94	$867,116 41	$212,656 53
Net, four months	498,983 13	425,814 56	73,168 57

The Consumers' Light, Heat and Power Company—capital, $1,000,000—has filed articles of incorporation at Elizabeth, N. J. The incorporators are George F. Chapman, Elizabeth; David Young, John W. Omberson, William E. O'Connor, Newark; William J. Davis, Harrison, and John E. McArthur, Jersey City. The company will have headquarters in Elizabeth. Essex, Union, Hudson and Middlesex counties will be supplied with electric current.

SCIENCE ABSTRACTS.

The following extracts of interest to our scientific readers are from the official publication of the Institution of Electrical Engineers, London, edited by Mr. J. Swinburne:

Electro-motive Force. J. Trowbridge. (Amer. Journ. Sci. 5, pp. 57–58, 1898.)—By means of an improved Planté rheostatic machine, giving up to 1,200,000 volts, the relation of electro-motive force to sparking distance in air was investigated. It was found that at high values the electro-motive force necessary for sparking increased only at the same rate as the sparking distance, which is in direct contrast to the behavior at low values, and is in agreement with Lord Kelvin's conjecture.

Source of Roentgen Rays. J. Trowbridge and J. E. Burbank. (Phil. Mag. 45, pp. 185–191, 1898; and Amer. Journ. Sci. 5. pp. 129–134, 1898.)—Cathode rays and Roentgen rays are given off from every element of a continuous conductor in a Crookes tube at a high vacuum, and this occurs both when the conductor constitutes the cathode and when it forms the anode of an electrical circuit. The so-called Roentgen-ray burn of the skin can be produced by an intense state of electrification.

Coloration by Cathode Rays. E. Wiedemann and G. C. Schmidt. (Annal. Phys. Chem. 64, pp. 78–91, 1898.)—The authors support their theory of the coloration of alkaline chlorides by further experiments, undertaken with a view of testing whether such coloration is actually due to the formation of sub-chlorides. The salt was placed in a tube provided with an external cathode, which could be moved along the tube. The salt was exposed to the rays for several days, and shaken up now and then to expose fresh surfaces. On pouring the salt into water containing a little phenol-phthaleïn, a red coloration was obtained. The formation of free chlorine was proved by means of mercury, which formed mercuric chloride. The amount of the salt decomposed is excessively small, but there is no doubt that the coloration is due to a chemical reduction and not to a physical change.

Glow-worm Rays. H. Muraoka and M. Kasuya. (Annal. Phys. Chem. 64, pp. 186–192, 1898.)—The photographic effect of glow-worm light, apparently exerted through a black paper covering, is not solely due to the rays shed by the insects, but partly at least to some influence of vapors proceeding from them. Similar photographic effects are caused by moist brown paper, resin and coffee. Zinc, magnesium and cadmium exert a similar influence, but mica or glass stops it. An experiment made with cadmium oxide still awaits explanation. A small square was cut out of a sheet of stout cardboard. The square was filled with powdered cadmium oxide. Another piece of cardboard, with a larger square cut out of it, was laid upon the first. A sensitive plate laid on the top was only blackened to the extent of the smaller square, and the blackening could be stopped by the insertion of a piece of copper.

Failure of Resistance Coils. R. Appleyard. (Phil. Mag. 45, pp. 157–163, 1898.)—Attention is directed to the serious mechanical weakness of certain alloys, particularly of german silver and platinoid. Several thousands of specimens, in the form of bobbins of wire, were submitted to India, Brazil, Chili, Peru, Ecuador, Nicaragua, Mexico and Texas. For comparison and reference others were kept in England. In periods of time varying from a few weeks to three years after this distribution, faulty bobbins were reported from certain localities. It happens that these localities all lie on or near seacoasts. They are nearly all within the isotherm of high terrestial mean temperature, 25 degrees centigrade. In all cases of failure, the alloy had become brittle and the wire was broken. Some specimens of wire were rotten from end to end. A short history is given of those that failed. It is shown that failure may occur without electric current, and apart from all ebonite, sulphur and paraffin-wax. Paraffin-wax is highly absorbent of moisture, and quite useless against climate. The deteriorating effects of heat and moisture are not limited to mixed metals. A large tube made of electrolytic copper, presumably pure, became very seriously "pitted" under the influence of steam. Another tube of the same electrolytic copper became similarly "pitted" when used for conveying sea-water. When these were replaced by tubes of ordinary copper, there was no further trouble.

The author suggests that two kinds of brittleness ought to be discriminated—(1) "Primary brittleness," as, for instance, that exhibited by gold when alloyed with lead, with arsenic, or with bismuth. In such cases brittleness is characteristic of the alloy from the moment of solidification. (2) "Secondary brittleness," a subsequent and more gradual phenomenon, as, for instance, that exhibited by certain varieties of german silver, months or even years after solidification. "Primary brittleness" is an accident of birth; "secondary brittleness" is a disease that develops with age and circumstance. Deteriorated german silver, or platinoid, when examined under the microscope, is seen to contain crevices and fissures; the section has patches of various colors, corresponding, most probably, to separate masses of "liquated" metal. It is further suggested that by the process of "liquation" homogeneity of structure is lost, consequently the tensile strength of the material varies from point to point of its mass; so also does the electrical conductivity. In passing afterwards through the die of the wire maker, the weaker constituents give way; thus incipient crevices are formed, and through these capillary channels moisture subsequently intrudes. If such wires are used for electric currents, maximum heating occurs at the weakened sections; this accounts for the failure of german silver resistance coils on arc-light and other circuits. The separate masses of dissimilar metals constitute local circuits of very small resistance, and within these circuits internal currents act destructively upon the alloys.

The secret of permanence in electrical alloys is being studied with a view to commerce by the Reichsanstalt in Germany. British cable manufacturers are already importing thousands of tons annually of sheathing wires from Germany, and it is to be regretted that, for want of a national laboratory, British instrument makers will soon be obliged to obtain their resistance wire from that same source.

ELECTRIC LIGHT FLASHES.

The Anniston, Ala., Electric Company is considering the sale of its property or the increase of capital and reorganization and the purchase of additional property.

The Key West Electric Company, of Trenton, N. J., has been incorporated; capital stock, $300,000; incorporators, Harry E. Knight, of Westfield, and William E. Knight and David J. Newland, of New York.

The Lancaster, Pa., Electric Light, Heat and Power Company has increased the capital stock from $150,000 to $250,000 and will issue bonds to the amount of $100,000. The increase is to be used in enlarging the plant.

Suffolk Gas and Electric Light Company of the towns of Islip and Babylon, Suffolk County, has been incorporated. Capital stock, $200,000. Directors, Charles F. Street, Hunter Wykes and William B. Hord, of New York city.

The Westinghouse Electric and Manufacturing Company has closed a contract for the furnishing of a complete electrical equipment for the San Jose Light and Power Company, of San Jose, Cal. The contract is for all kinds of electrical machinery, and figures close to $150,000.

The Lansdale, Pa., Electric Light Company has sold to the borough of Lansdale the entire electric light plant, owned and operated by the company, for $4,000. The borough will now purchase a lot and erect a plant to supply the town with commercial and street lights at cost.

A special meeting of the Edison Electric Illuminating Company of Brooklyn is to be held June 2 to take action on the proposition to increase the capital stock $1,000,000 to $5,000,000, for the completion of negotiations now on hand, and for extending the business of the company.

At the annual meeting of the Mechanic Falls, N. Y., Water, Electric Light and Power Company, the following officers were elected for the ensuing year: Horace Purinton, president; H. C. Rowell, vice-president; L. A. Moulton, treasurer; H. T. Sands, clerk. Directors, Horace Purinton, H. C. Rowell, L. A. Moulton, Percival Bonney, S. S. Waterhouse.

John F. McNider has sued the New Omaha, Neb., Thomson-Houston Electric Light Company in an action to recover the sum of $16,000. The plaintiff alleges that while in the employ of the company he was repairing an electric line at Sixteenth street and Capitol avenue and stepped on a live wire, receiving injuries that necessitated the amputation of the toes upon one of his feet. He blames the company for the accident, and says that the wire was in an exposed and unsafe condition.

At the annual meeting of the stockholders of the Denver, Colo., Consolidated Electric Company the following officers and directors were chosen for the ensuing year. President, E. W. Rollins; vice-president, A. S. Hughes; general manager, John H. Poole; secretary and treasurer, T. H. Reynolds. The directors elected are as follows: A. S. Hughes, H. T. Rogers, F. A. Keener, E. L. Foster, J. H. Poole, T. E. Poole, T. H. Reynolds, G. H. Taylor, A. E. Greer, E. W. Rollins and H. K. Devereaux.

American Society of Mechanical Engineers.

The thirty-seventh meeting of the American Society of Mechanical Engineers will be held at Niagara Falls, N. Y., from May 31 to June 3. The professional sessions will be held at the Cataract House, where convention headquarters will also be established. The local arrangements are in charge of the Engineers' Society of Western New York. The usual excellent programme of papers contains many of value to mechanical engineers, and the entertainment provided will be of an interesting and enjoyable character.

Moderate-Speed Motors.

In redesigning its line of motors to run at slow and moderate speeds the General Electric Company has adopted valuable improvements, which experience with motors of former types and careful observation of their operation under actual commercial working conditions have proved advisable. The motors of the present type are, for their output, said to be probably the lightest and most compact built.

For all powers up to and including five horse-power in the slow speed and eight horse-power in the moderate speed the motors are bipolar; in larger motors up to and including 95 horse-power four-pole construction is used. The latter method of construction has been adopted for large and moderate sized motors on account of its many manifest advantages; viz., shorter magnetic circuits with consequent reduced exciting current, greater output and higher efficiency for given weight and speed, economical distribution of magnetic material and minimum of floor space. While in motors of a given design reduction of speed necessitates increase of weight if the same output and excellence of construction is obtained, the four-pole design of the General Electric Company effects such economy of material that the output is extremely large compared with the size and weight of the machine.

The frames are of iron of the highest quality and the pole pieces of special soft steel. As the pole pieces are readily removable, the field coils may be taken off and changed without disturbing either the frame or armature. The frame is divided horizontally and the upper part may be easily lifted off to gain access to the armature. The pillow blocks of the four-pole machines are cast with the bed-plate and the lower part of the machine; thus insuring perfect centering of the armature. The bearings are all self-aligning, self-oiling and of ample size. The core is built up of laminations slotted to receive the armature coils which, lying below the outer surface of the core, are protected from mechanical strain or abrasion. The spider carrying the core is prolonged at each end in two flanges, upon which the ends of the coils lie without being bent. The armature is wound with the well known General Electric barrel winding, which provides a large radiating surface for armature conductors and reduces the length of wire to a minimum; thus reducing armature resistance losses and increasing the efficiency of the motor. The coils may be readily removed and replaced, and being embedded in the slots can neither move relatively to the core nor vibrate. When the armature turns, air is drawn in to the ventilating ducts provided in the core and to circulate through the entire armature structure and reduce its temperature. The exceptionally low running temperature of these motors is obtained by designing every part so as to reduce losses to a minimum and providing a complete system of air circulation. The coils are made on forms and separately tested before assembling on the core. The insulation is the same as that used in the General Electric railway motors and various tests have shown that it is tough, impervious to moisture and practically indestructible, even under heavy overloads or by lightning. The commutator segments are of hard drawn copper, supported on a separate-spider and the connections between them and the armature coils are carefully made to prevent the possibility of open-circuiting.

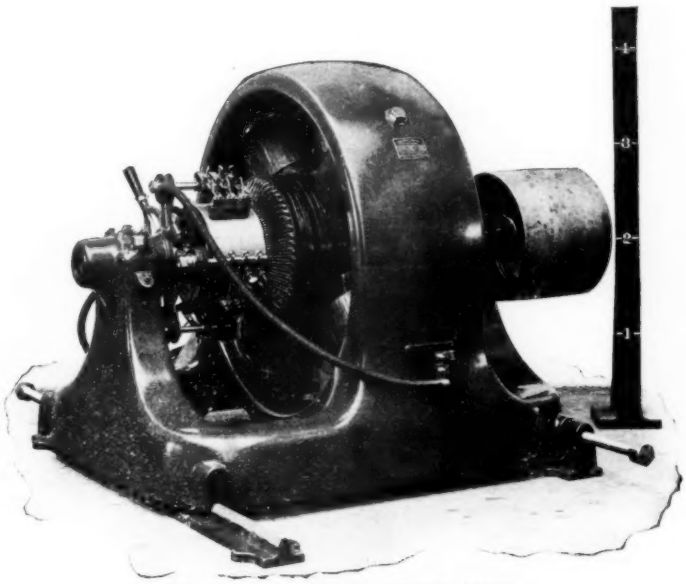


FIG. 1.—LARGE MODERATE-SPEED MOTOR.

The brush-holders have a solid casting connecting the brush-box with the stud and an adjustable pressure spring giving an even pressure and firm and accurate contact of the carbon brushes and the commutator—an important factor in securing sparkless and noiseless operation. A flexible conductor permanently attached to the brush connects it with the brush-holder and allows of free movement of the brush in the holder, while avoiding any resistance from imperfect connection. Change from no load to overload can be made without changing the position of the brushes and without sparking. The only wear on the commutator is the friction of the brushes, which is practically negligible. In the bipolar machines the projecting field effectually protects the spools and armature from injury. Stability is secured in these machines by so designing the heavy parts as to bring the center of gravity very low. All parts of both the four-pole and the bipolar motors are accurately made to gauge, and are thus interchangeable.

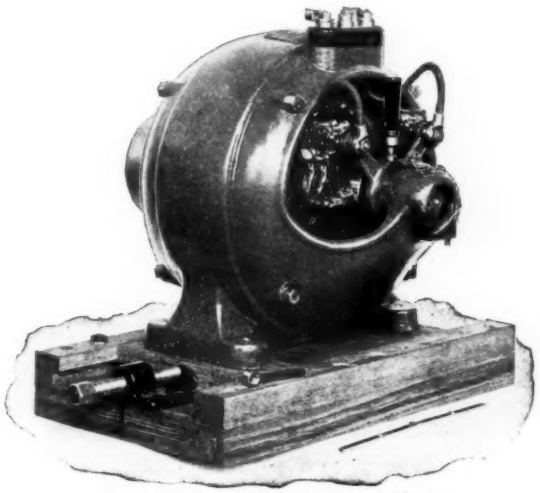


FIG. 2.—SMALL MODERATE SPEED MOTOR.

The substitution of new parts requires no special skill and can readily be made by the man in charge of the machine. On account of the slow speeds of the four-pole motors they may be belted directly to ordinary slow-speed line shafting without immediate counter shafting. They are, therefore, especially adapted to all factory, mill and shop requirements. The bipolar type is adapted to the driving of lathes, printing presses, fans, drills, pumps and, indeed, to almost any work where small units of power are required and little space is available. They are arranged to run in any position, whether suspended from the ceiling, attached to a wall, or set upon the floor.

ELECTRIC RAILWAY NOTES.

Judge Richardson has signed a judgment for $21,000 in favor of the plaintiff, in the case of Mary Elizabeth Lane against the Spokane Falls, Wash., & Northern Railway Company.

The Realty Syndicate has had attachments served on the East Oakland, Cal., Street Railroad Company to satisfy a claim of $50,000. It covers the real estate at Thirteenth avenue and East Twenty-first street, all of the tracks, equipments, franchises, rights, permit to construct, lay down, maintain and operate street railroads.

At the annual meeting of the Camden, Gloucester & Woodbury, N. J., Electric Railway Company, the following officers were elected for the ensuing year: President, J. Willard Morgan; treasurer, William J. Thompson; secretary, Thomas P. Curley; directors, William J. Thompson, Augustus Muller, Henry M. Harley, David Baird, J. Willard Morgan, Thomas P. Curley, John J. Curley, Thad. P. Varney and Henry J. West.

The Dayton, Springfield & Urbana, Ohio, Transit Company, with a capital stock of $1,000,000, has been organized for the purpose of building and operating an electric line between this city and Dayton, the line to be ultimately extended north to Urbana. The officers of the company are: President, A. E. Appleyard, Boston; vice-president, John S. Harshman; secretary, John S. Webb; manager, Col. Fred Colburn, Louisville, Ky.; superintendent, W. H. Hanford, of Dayton.

The Bluff City Electric Railway Company has been sold to the Chicago & Milwaukee Electric Railway Company, a new corporation intending to complete and equip the road. The directors of the new company are George A. Ball, A. C. Frost, G. M. Seward, F. S. Reeves and C. E. Loss. The company has $1,000,000 capital stock, and will execute a mortgage to secure $1,000,000 bonds. It is estimated that it will cost three-fourths of that amount to complete the road, which will then be 31 miles long. Work is now in progress between Waukegan and Highland Park. It is expected that the line will be completed to Evanston by October 1.

THE ELECTRICAL SHOW.

(Concluded from page 333.)

York; May 19, No. 23, New York city; May 20, Phœnix and No. 24, New York; May 21, No. 3, of New Jersey, and No. 8, of New York.

On Friday evening last there was placed on exhibition in the south gallery the sword of Lieut. Friend W. Jenkins, who lost his life when the ill-fated "Maine" was blown up in Havana harbor. The sword was loaned by Lieutenant Jenkins's brother, who resides in New York, who placed it on exhibition from patriotic motives. There are also shown a number of relics from the "Maine," including incandescent lamps, pieces of wire and a number of shells. These exhibits attracted large crowds, and created a great deal of interest.

Another feature on Friday night was the connection of the show with a Milwaukee theater by long-distance telephone. The novelty of standing in Madison Square Garden and hearing a theatrical performance in Milwaukee was greatly appreciated by numerous visitors.

The wax tableaux, showing episodes in the historical progress of electrical development, continue to attract large audiences.

ELECTRICAL EXHIBITION NOTES.

The Electric Storage Battery Company's sign, 50 feet long, is one of the first features that attracts attention upon entering the Garden. Just below this sign, there is mounted a row of large glass jars, each one carrying one letter of the words "chloride accumulator," the well known trade-mark of the company. Dummy lugs are used for connecting the jars together, and they present the appearance of a fully equipped battery. When illuminated from within, the sign presents a particularly attractive appearance. A novel use of battery plates is shown in the sign which extends along the rear wall of the space. Twenty-seven plates of type G are shown, each plate showing in unformed lead, one letter of the company's name, the portion of the plate around the latter being peroxodized. At the rear of the space, and mounted upon a handsomely finished stand, is a battery of 60 chloride accumulators of type F–11; this battery supplies power for operating the numberless motors, the sizes ranging from the smallest to the largest, in the adjoining space occupied by the Sprague Electric Company. As these motors are constantly being thrown on and off, the load on the battery is a varying one, having fluctuations of from 0 to 250 amperes. The battery connected across the line and charged from a constant source of supply, operates as a regulator of potential, the voltmeter needle remaining absolutely constant under the variations in load stated above. This application is a very interesting one, as demonstrating the use of chloride accumulators in connection with electric elevators and on trolley lines. Near the front of the exhibit are two large central station cells; one containing 27 plates, 15½ inches by 32 inches, is placarded as being the largest central station cell in operation at the time of the last electrical exhibition in New York, in May, '96; the adjoining cell is from the largest storage battery in the world, and is one of the 166 cells which are being installed for the Chicago Edison Company. The front of the cell is cut away, permitting a very interesting view of the method of construction and plate suspension; the tank is 76⅜ inches long by 40½ inches high by 21½ inches wide, and contains 83 plates, each 15½ inches by 32 inches. At the other end of the exhibit is a 25-foot electric launch of the most modern type built by the Electric Launch Company, at Morris Heights, N. Y., and equipped with chloride accumulators. A chloride accumulator for welding work is also shown. This outfit consists of one cell of type F–11 with a normal discharge of 50 amperes connected by heavy cables to copper clamps, by which the metal to be welded is gripped. In the welding operations that are being shown the cell discharges rates ranging from 400 amperes to 1,000 amperes. Chloride accumulators in portable form are shown operating phonographs, spark coils, fan motors, lamps, etc., and are also in use by a number of other exhibitors who have appliances calling for small powers. The battery company is distributing a very neat foot rule, which is much appreciated by the recipients. The exhibit is in charge of Mr. Chas. Blizard, manager of the company's New York office, and Messrs. Albert Taylor, T. B. Entz, G. A. Robertson, W. H. Palmer and Carroll Hodge.

EXHIBIT OF THE ELECTRIC STORAGE BATTERY COMPANY AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

To the careful observer strolling through the exhibits, none of them is more striking than the Hornsby–Akroyd engine, which, though it looks like the ordinary type of gas or gasoline engine, is far from being one. Its fuel is ordinary white oil of high flashing temperature, but its manner of use is very different from the explosion type of gas or oil engines. It is a slow combustion engine, so to speak, and its operation is very simple. After an initial heating of a vaporizing chamber, the piston compresses air therein, and a quantity of oil is pumped into same chamber. The air being heated above the temperature of combustion of the oil, the latter is gasified, increasing the pressure and acting on the piston. A governor controls automatically the supply of oil according to the load, and the speed is exceedingly constant under great and sudden changes of load, thus adapting the engine perfectly to all kinds of isolated electric lighting. The efficiency of such an engine is necessarily very high, and using only safe oil and having none of the alleged dangers of an explosion type of engine, the "Hornsby–Akroyd" ought to find a large field awaiting it. The De La Vergne Refrigerating Machine Company, of this city, are the manufacturers of the engine, and claim that the cost of running is only one-half that of a gas engine at $1 per thousand for gas, a statement of sufficient moment to attract attention, since it means a cost of one cent per brake-horse-power hour.

The instruments for the telegraph tournament were very kindly loaned the exposition management by the Western Electric Company, J. H. Bunnell & Company, and William Marshall.

The Fischer Engines—A tandem compound steam engine is exhibited by the Fischer Foundry and Machine Company, of Pittsburgh, which is worthy of note. Its main feature is an ingenious adaptation of the idea of separate admission and exhaust valves to a high-speed center-crank engine, and the idea has been well worked out. The valves are special forms of the gridiron or "slide," and the schemes of close clearance, adjustment and take-up for wear and tear are very simple. There is, undoubtedly, a market awaiting this engine.

Zimdars & Hunt, New York, have a very complete line of automatic switches and a motor starter and kindred apparatus of this nature. This company have in the past year brought these goods prominently before the electrical field. The well arranged exhibit also includes a variety of panel and feeder-boards of modern construction.

The Weston Electrical Instrument Company have a complete line of all the standard "Weston" instruments, which include various forms of ammeters, volt meters, lamp measuring instruments, volt ammeters, ohm meters, etc. The reputation and standing of the "Weston" instruments are too well known to require any extended description as to detail, the interest being in the newest forms of the different characters of instruments. This neat and attractive exhibit is pictured in the REVIEW this week.

The Fostoria Incandescent Lamp Company and the Crouse–Tremaine Carbon Company, Fostoria, Ohio, have combined and prepared one of the most effectively lighted exhibitions to be seen in the hall; a number of columns prettily draped, bare at their top; great globes studded with incandescent lamps of many colors, and at the rear an arrangement of five circuits which show the many styles of decorative and standard lamps. These circuits show the different lamps. One has the "Duplex" lamp which is made under a patent controlled by this company and which permits the candle-power to be changed by means of a switch at the base. One circuit shows the 200-candle-power tubular candelabra lamp. The arrangement of the many different kinds of carbons, the product of the Crouse–Tremaine factories, also helps the artistic effect of the exhibition.

Perhaps the most complete showing of arc lamps in the exposition is that made by the Adams–Bagnall Electric Company, Cleveland, the arrangement for which was supervised by the New York manager, Mr. C. W. Phipps. The finish and style of the lamps shown by this company are very attractive. Among the different styles are lamps designed for constant current, open arc lamps from 12 to 2,000 candle-power for continuous night burning, series enclosed lamps, constant-potential series enclosed, designed for a series of five or 550 volts and also two in series of 220 volts.

The phonographic and X-ray exhibition of the Edison Manufacturing

Company and the National Phonograph Company nightly attract a large audience. The X-ray feature is still quite new to a large element of the public, and the splendid development which has been obtained by the National Phonograph Company makes the new phonograph of interest to all. A view of this exhibit appears in the ELECTRICAL REVIEW this week.

The Electrical Engineer Institute of Correspondence Instruction has an exhibit on the main floor, which is a great center of attraction to both the layman and expert. This enterprising institution has, at great expense, fitted up a most complete laboratory

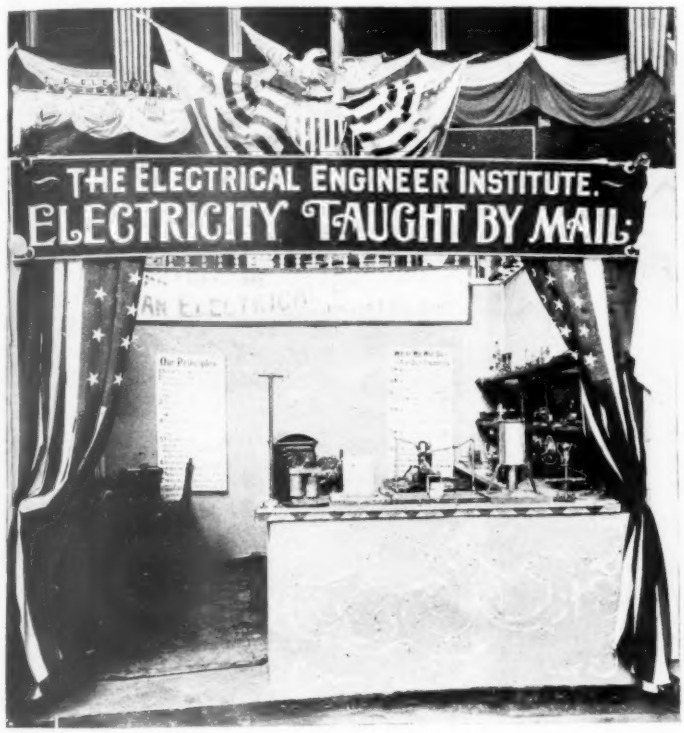


EXHIBIT OF THE ELECTRICAL ENGINEER INSTITUTE OF CORRESPONDENCE INSTRUCTION AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

at its booth, and nightly demonstrations are given with the various apparatus. The experiments include almost all the important electrical manifestations, methods of generating electricity and many of the practical applications. The demonstrations begin about 8 P. M., and continue until the closing hour. The interest taken in these experimental demonstrations is clearly manifested by the large and constant gatherings in front of the booth. Mr. Joseph Sachs, of the Institute staff, is in charge of the laboratory, and, in demonstrating the various experiments, accompanies each with a clear and lucid description, worded so that even the non-technical mind can grasp the principles involved. To still further simplify and clear up the various electrical phenomena, a booklet entitled "Popularized Electrical Experiments" has been prepared, in which all the experiments are arranged in graded order, each being accompanied by an excellently clear, although concise, description. The audience is always eager to get these booklets, which are distributed free of charge and furnish a most excellent syllabus of electricity and its applications. The elaborate and artistic Institute catalogues are also in great demand. The experiments range from the elementary demonstration of the deflection of a needle to the more complex phenomena of the electric furnace and electro-chemical effects. Particularly prominent, however, are the production of calcium carbide, the electric water-pail forge, electric welding, electric arc metal working and the experimental demonstrations of the principles upon which the motor and dynamo are based. Many who are at first attracted by these fascinating experiments become intensely interested and a large number of students have already been enrolled at the exhibition. Judging from the multitude of inquiries and the favorable opinions of prominent electrical men at the show, the Institute is an important factor in electrical engineering education. As an educational effort, the "Popularized Electrical Experiments" are worthy of the highest commendation. The exhibition management, fully appreciative of this fact, has requested the Institute to present the lecture on a larger scale in the concert hall. This invitation has been accepted, and popular lectures on electricity, with brilliant experiments, will be delivered by Mr. Sachs during the two remaining weeks. These lectures are free to all, and are to be regarded as a contribution to popular education by the Institute. Mr. Herman A. Strauss, general manager of the Institute, and an able corps of assistants, including Mr. Willard M. Miner, Mr. Edward Hyans and Mr. M. Cushner are at the exhibition every evening. They are almost constantly in consultation with eager inquirers and enrolling students. The fact that the guarantee of *The Electrical Engineer* accompanies all the Institute's work has proved to be an inducement to many who fully appreciate the absolute good faith, trustworthiness and technical reliability of the instruction offered them.

The Sterling Supply and Manufacturing Company, New York, are

VIEW AT THE ELECTRICAL EXPOSITION, SHOWING PARTS OF EXHIBITS OF H. B. COHO & COMPANY, CROWN WOVEN WIRE BRUSH COMPANY AND OTIS ELEVATOR COMPANY.

represented in the electric car exhibit, which is fitted up with their brake, register, sand-box, etc. This car, as it passes back and forth on the elevated track, is very noticeable, and the street railway men from all parts of the country are to be seen inspecting it. The Sterling goods, famous for quality and efficiency, are closely observed and tested.

Messrs. J. Jones & Son, 67 Cortlandt street, New York, have an unique exhibition well located near the main entrance, in which are shown a comprehensive line of electrical equipments, of most of which they are the manufacturers. Included in the apparatus which is being shown by them is a switchboard on which are placed specimens of their different styles of switches. This board has been much admired by electricians as an illustration of the modern electric switchboard; in addition to this completed switchboard a variety of panel boards is exhibited, also a new time cut-out switch, a recently perfected enclosed arc lamp of new design, which will soon be placed on the market, electric heating apparatus, improved forms of medical batteries, electric alarm clocks, bracket switches. Messrs. Jones & Son and several other gentlemen of the company are frequently in attendance. Messrs. J. Jones & Son have recently moved into new quarters at 64 Cortlandt street, nearly opposite the store occupied by them for many years. The company occupy the entire building at the new location, and now have one of the most complete stocks of electrical supplies carried by any company in New York.

One of the most impressive sights of the exposition is the operative exhibits, especially the motors and steam, oil and gas engines. Motors of several types are shown in operation, both on the main floor and in the basement. These include machines manufactured by the Walker Company, Crocker-Wheeler Electric Company, Sprague Electric Company, C & C Electric Company, Bullock Electric Company and the Eddy Electric Manufacturing Company. Numerous types and sizes are shown, so that the seeker after information on the electric motor question can secure his fill of facts. In the basement one of the handsomest exhibits is that of the Delavergne Refrigerating Machine Company, which includes three sizes of the Hornsby-Akroyd oil engine, one of which is

(Concluded on page 343.)

TOLD IN THE DYNAMO-ROOM—XI.

It was an unusually warm afternoon for the time of the year, when Benson, the engineer, and Ned, the dynamo man, were sitting on a bench in front of the Centerville station, having an hour or so before starting-up time. Jim, the lineman, was not there, because the long-looked-for event had finally taken place a few days ago. The fair young lady, formerly of the Metropolis Hotel, had at last consented to become Mrs. James Dawson, and the happy couple were away on a two weeks' tour, presumably undisturbed by open circuits, crossed lines or passed carbons. The wedding was one of the events in Centerville, the ceremony taking place in one of the Metropolis parlors, which had been gorgeously decorated and illuminated for the occasion, Mr. Evans having given Benson and Ned *carte blanche* to use all the current, lamps and wire they needed.

STANLEY & PATTERSON'S EXHIBIT AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

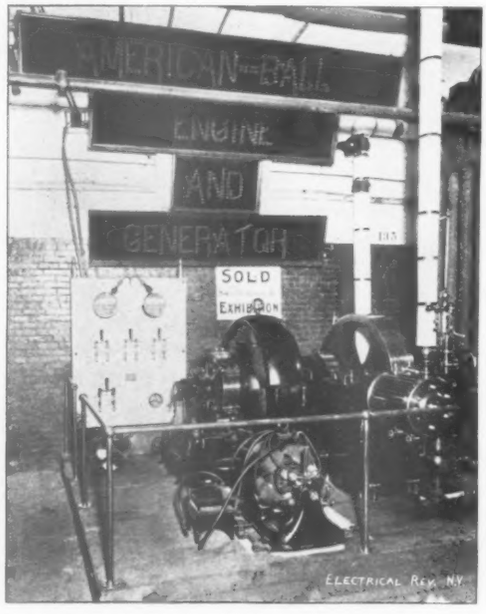
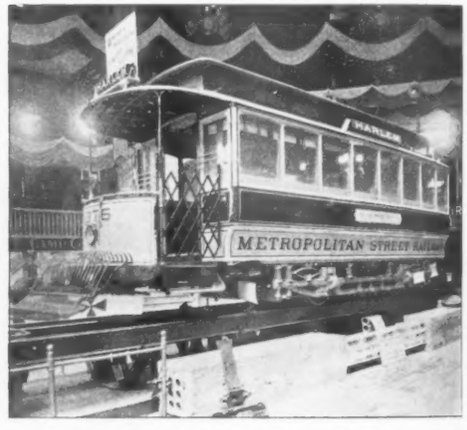


EXHIBIT OF THE AMERICAN ENGINE COMPANY AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.



FULL SIZE UNDERGROUND TROLLEY-CAR, SHOWN AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

So the two, assisted by Dick Harlow, of the Postal company, and Ben O'Neill, the superintendent of the street railway, had carted up a couple of hundred light transformers, a barrel of lamps (some of them all colors of the rainbow) and enough wire, cable, cords, fuse blocks and other necessaries to transform the room into a fairy bower of light, rivaling the most elaborate Kiralfy production of the "Black Crook."

Old Dettmer had constructed an arch over the sidewalk in front of the ladies' entrance, just like the Triumphal Arch in Paris, as he afterward explained, because "I through it marched in 1871, when we licked those tam Frenchmen, don't it?" At the top of the arch Ned had concealed, unknown to all but himself, a good-sized box, hidden among the garlands of smilax and flowers. This box had a hinged bottom, held in place by a little iron catch, so arranged in combination with an old call-bell magnet that the touch of a button would release the trigger-like catch, and at the proper moment, just as the radiant groom and blushing bride were about to enter the waiting carriage, Ned touched the button and the box full of rice did the rest.

"That's some of Ned's work. Just wait till we get back!" Jim shouted, as he frantically tried to dislodge a handful of the Japanese cereal from the back of his neck; and amid the shouts and laughter and hurrahs and good-bys of the crowd the couple were driven to the depot. Some of the presents sent by relatives and friends were interesting. Mr. Woodville, one of Jim's friends who was in the rail-bond business, sent a solid-gold shawl-pin in the shape of a miniature rail-bond, accompanied by the wish that the bond uniting the two might prove as strong and lasting as the Woodville bond. The Aurora Glass Company contributed a beautifully frosted and decorated punch bowl in the shape of an arc globe, expressing the hope that its contents might serve to diffuse a soft glow of cheerfulness through their lives. Other presents were equally appropriate and indicative in some detail or other of Jim's calling.

It had been a great affair, and Ned and Benson were just recounting the pleasant incidents of that evening, when they saw Gus Hart coming down the street, who, it should be stated, had been secured by Jim to look after trouble and, in general, perform Jim's duties during the latter's absence. Gus had shown some excellent recommendations, the great number of which seemed to indicate that he was quite a traveler. Mr. Evans had approved of his taking Jim's place, and it needed only a day or two to convince Benson and Ned that Gus was very sociable, and a splendid story-teller besides. There was hardly a town where Gus had not been, and nothing could ever happen in the way of an accident or trouble, but he had met with a similar occurrence at such and such a place.

"Well, Gus, did you find the ground on B circuit all right?" asked Ned, as Gus approached the station, and, after having divested himself of his tool-belt and climbers, took a seat near our two friends.

"Why, cert; easiest thing in the world," replied Gus, carefully undoing the tin-foil from a rather dark-looking brick of compressed tobacco, licorice and molasses, otherwise known as "Navy Plug." "You know where the line turns the corner at Tenth and Market streets, and the lamp is suspended from a cable strung diagonally from corner to corner? Well, this new Mutual Telephone Company had been stringing wire around there, and as they had to go above us they pulled their wire over ours till it was almost sawed in two. Then they must have run out of wire, for they had tied the end of their line around the bottom of the next pole, and left it that way, pulling down on ours good and hard."

"That was certainly a mean trick," remarked Benson. "Did you fix it?"

"Did I fix it? You ought to have seen the end of that hard-drawn copper after I had taken my Stubbs and snipped it off. The way it went cavorting along the other wires and finally landed at the next pole, a beautiful mass of kinks and curls and curves, would make you laugh. But do you see that dark cloud making its appearance just over the top of Dettmer's house? It starts out just like one of those Kansas cyclone affairs you read about. A dynamo doesn't stand much of a show in one of those firework displays, no matter how many lightning arresters you have. Do you have much trouble from lightning around here?"

"Oh, I suppose we get our share of it during the Summer months, the same as all stations," answered Ned, casting a look of apprehension at the darkening sky. "But the way we are fixed with lightning arresters and kicking coils, I anticipate little damage, eh, Benson?"

"Yes, I guess we'll pull her through this Summer same as last. I don't think we lost a transformer even," spoke the engineer; "but then the boss is not one of those managers who trust to luck and Providence. When it comes to guarding against lightning, he is quite a protectionist."

"Yes, that's all right," retorted Gus, "but when I was running as assistant engineer in the power station at Garden City, I had an experience I'll not forget soon, and we had just put in some new lightning arresters, too."

"I imagine this is one of your actual experiences, or you wouldn't tell it," sarcastically remarked Benson; "but go ahead and let's hear it."

"Yes, and cut it short, as it is almost time to start up," added Ned.

"It was one Saturday afternoon in the Summer of '96, I think," began Gus. "We were carrying quite a load, having 17 cars using about 650 amperes. There were many clouds rising in the West, but no sign of a regular thunder-storm in the immediate vicinity. Still the chief engineer had sent me out several times to watch for any approaching storm. On my last observation I remarked to Billy Barber, a friend of mine, that I would like to see about a yard of lightning come in and see if the lightning arresters would work. Seeing no immediate danger from the storm, the chief sent me down to put

on the condenser. I was in the act of starting the pump when there came a blinding flash and report which came near taking me off my pins. As soon as I could collect my senses I walked upstairs to find that that yard of lightning I was wishing for had come, and incidently destroyed a $1,000 armature. At the time this happened the sun was shining brightly, but in the west the clouds were black and threatening. Not one of the arresters had moved, neither had the circuit-breakers opened, but the stroke seemed to have gone direct to the machine. On examination we found a hole in one side of the armature, about four inches in diameter, burned clear into the core, and the bands were all melted off, but otherwise the machine seemed all right."

"Well, that is certainly a peculiar case," exclaimed Ned. "I can hardly believe that the accident was caused by lightning. Was nobody on the floor at the time who might have seen the flash come in?"

"No one, except four carpenters, who were laying a new hardwood floor in the engine-room, and the way they acted made us all laugh in spite of the serious damage done. Two of them flew out of the large folding doors, the third went through the side door with a velocity of 60 point naught, as Ned would say, and the fourth, most frightened of all, climbed over a pile of flooring and jumped out of the window, landing sprawling in a pile of sand."

"Now, hold on a minute," cried Ned, as soon as Benson and Gus had ceased the laughter the latter's droll relation of the incident had caused. "You say some carpenters were laying hardwood flooring near the generator? Well, let me tell you one thing. Lightning was not guilty in that instance. It was simply a nail that flew from under one of the carpenter's hammers and landed in the armature, thereby causing a loss of $1,000. You can gamble on it."

"By ginger! I believe you're right," exclaimed Gus. "It's funny we never thought of that."

"Well, you see lightning gets blamed for a good many sins, but if properly handled, it can be made comparatively harmless. I've studied over it and static discharges in general quite a bit, and some day I'll give you my views on the subject. But here, it's nearly five o'clock, so we better get to work."

So they began their usual work, and soon had everything running with its customary smoothness.

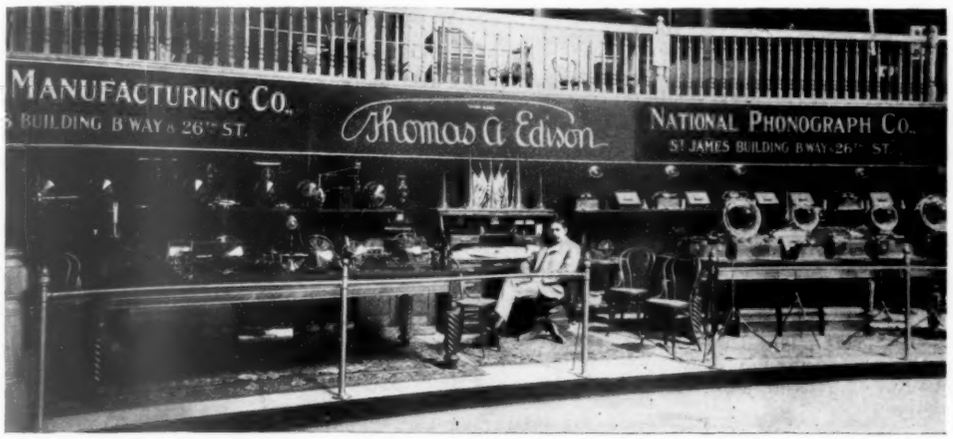


EXHIBIT OF THE EDISON MANUFACTURING COMPANY AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

THE EFFECTS OF ALTERNATING CURRENTS ON THE HUMAN BODY.*

BY DR. W. S. HEDLEY.

There have lately been recorded (*Electrotechnische Zeitschrift*) a series of experiments undertaken by Professor Weber, of Zurich, to determine the effects upon the living body of alternating currents at different voltages. Two metallic conductors at opposite potentials were held, one in each hand. With the hands damp, an effective electro-motive force of 30 volts and 50 alternations a second, the whole arm seemed paralyzed; extended, it could not be flexed; flexed, it could not be extended. At the same time, the pain was so severe, that it could not be borne for more than five or six seconds. It was not without effort that the hands could be detached from the electrodes. When the voltage was raised to 50, fixation occurred; that is to say, the hands could not by any voluntary effort be released from the electrodes, and the pain was not supportable for more than two or three seconds. With the voltage raised to 80, even with the hands dry, all the above phenomena were accentuated.

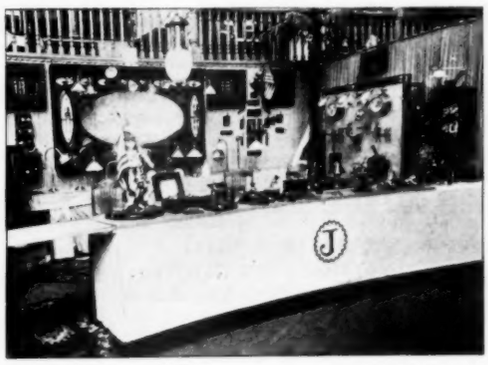
Other experiments followed to observe the effect of a current passing to earth through the body; thus, standing on a damp macadamized road, but with dry shoes, a person touching with his hand a conductor at a potential of 1,000 volts experienced a marked burning sensation, and when the conductor was grasped with the whole hand a violent tremor occurred, with complete fixation.

In the same journal M. Emile Kolben gives a case of an accidental contact of several minutes' duration, where the body was placed in the path of a current passing from hand to hand at 200 volts. In our present ignorance of the exact conditions which make electric currents dangerous, experiments of this kind are of great interest and value, and it is desirable that all such cases be assiduously recorded. But it is altogether premature to conclude, because the voltage of electric lighting currents may but little exceed that used in some of these experiments, that therefore such lighting currents are free from danger, or that a person with dry shoes, standing to earth on moist ground, need never be afraid of an alternating current whose potential does not exceed 1,000 volts. In a recent number of the ELECTRICAL REVIEW, reference is made to four fatal cases of accidental contact with live wires, in three of which the potential could not have exceeded 115 volts. Data must for a long time be accumulated, and a great deal more learnt about the human body as an electrical conductor before the line can be drawn beyond which electrical currents begin to be dangerous to life.

* *London Electrical Review.*

EXHIBIT OF THE MONTAUK MULTIPHASE CABLE COMPANY AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

THE HARDY INCANDESCENT LAMP EXHIBIT OF THE K. & W. COMPANY AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.



ELECTRICAL SUPPLY EXHIBIT OF J. JONES & SON AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

NEW SWEDEN, MINN.—The Nicollet County Telephone and Telegraph Company has been incorporated; capital, $3,000.

ATLANTIC, IOWA—The Atlantic, Mt. Etna and Corning Telephone Company has completed its lines to this place, and there is now communication south from this place with Cumberland, Massena, Brisco, Mt. Etna, Wiota, Carl, Hayes, Corning, and within a week there will be lines to Milford, Elliott, Strand and Villisca.

CAMBRIDGE, MINN.—The Northwestern Telephone Company will extend their telephone line from St. Francis to this place, thus giving this village a more direct communication with the outside world. Work has already begun, and the line will be completed by June 15. The telephone line, built from this place to Rush City by the Danewood Telephone Company, is proving to be a great convenience to our citizens. The company intend to extend their line to Spring Lake, Spencer Brook and Spring Vale during the coming Summer.

DETROIT, MICH.—The new line of the Michigan Telephone Company will soon connect Rosedale, Donaldson, Pickford, Brimlay and Eckerman, towns near the Soo.

JOHNSON CITY, TEX.—The Martin Telephone Company has been incorporated; capital stock, $10,000; incorporators, David Martin, J. W. Shugart and A. G. Perry.

KALAMAZOO, MICH.—The Independent Telephone Company has completed its lines from this place to Lansing. There is direct connection with Benton Harbor and as far south as Michigan City, Ind.

ELMA, IOWA—The Northwestern Telephone Company has just commenced a telephone line between this place and Charles City. The line will in all probability be continued to Cresco.

COLUMBUS, OHIO—The Ohio Telephone Company, of Wauseon, with a capital stock of $30,000, has been incorporated.

CHICAGO, ILL.—The Lake County Telephone Company has been incorporated by Libertyville parties. Their intention is to connect various towns and settlements in the western part of this county, with a central office at Libertyville, which will be connected with the Chicago Telephone Company's system.

TIFFIN, OHIO—The Home Telephone Company, of this city, will soon commence work on toll lines extending from this place to Fort Seneca, Old Fort, Greenspring, Bettsville, Burgoon, New Riegel, Berwick, Adrian and McCutchenville. The company's line to Fostoria will be completed this week. The company now has 450 telephones connected with its exchange in this place.

LEWISBURG, TENN.—Work on the telephone line from this place to Thicy, by way of Verona, Lillard's Mills and Caney Spring has been begun.

HAMPDEN, MASS.—The New England Telephone and Telegraph Company have extended a line to this place and established a public pay station at the post office.

CLEARFIELD, IOWA—Des Moines Southwestern Telephone Company, of Taylor County, has been incorporated with a capital stock of $20,000, to operate a telephone line; incorporators, D. N. Smith, R. R. Smith, C. F. Baum and S. L. Baum.

GALVA, ILL.—Galva Telephone Company has been incorporated; capital stock, $2,000; incorporators, George D. Palmer, T. H. Johnson and W. A. Wigren.

ALBANY, N. Y.—The Hudson River Telephone Company has about completed a line of wires from Hudson to Valatie.

BRENHAM, TEX.—The Brenham & Shelby Telephone Company has been organized with W. C. Henderson, president, and E. H. Eversberg, secretary.

CAMDEN, N. C.—The Camden Telephone Company has been incorporated by E. Mitchell, P. G. Morisette, H. T. Greenleaf, R. L. Forbes, C. S. Sawyer, J. A. McKinney, L. B. Hughes and others; to construct a telephone system, etc.; capital stock, $5,000.

BALTIMORE, MD.—The Baltimore & Bel Air Telephone Company has been incorporated by Alexander S. Bell, Harold Walsh, John M. Griffith, J. H. Hollingsworth, J. Alexis Shriver and Thos. R. Clendinen; for the purpose of constructing a telephone system; capital stock, $5,000.

CRAB ORCHARD, KY.—The Crab Orchard, Stanford & Mount Vernon Telephone Company has been incorporated by Curtis Gover, J. M. Bruce, A. E. Albright, A. H. Boston and James Moret; capital stock, $1,000.

BESSEMER CITY, N. C.—The Bessemer Telephone Company has been incorporated, with a capital stock of $750.

SPARTA, TENN.—The Gainesboro Telephone Company is about to commence the construction of its telephone line from Sparta to McMinnville.

EATONTON, GA.—E. H. Davis has obtained a franchise for telephone exchange and system.

CHARLESTON, W. VA.—The Mountain State Telephone and Telegraph Company has been incorporated by G. V. Forman, H. A. Forman, H. V. Thomas, J. W. Penhale and C. B. Couch; capital stock, $50,000.

KANSAS CITY, MO.—The Tri-State Telephone Company has been incorporated by E. Y. Phelps, C. H. Francis, James M. Girdner and others; capital stock, $200,000.

New Electric Railways.

HAMILTON, OHIO—The Cincinnati & Hamilton Electric Street Railway Company will begin the active construction of its line next week.

MALONE, N. Y.—An electric street railway is to be built along several of the principal streets of this town and extended into the Adirondacks nine miles, touching two popular Summer resorts, Lake Titus and Lake Duane. The company will be known as the Franklin County Railway Company and Malone Electric Street Railway.

WESTFIELD, N. J.—Work in securing the right of way for a cross-country electric road from Westfield to Rahway is now in progress.

COVINGTON, IND.—An electric railroad will be built from Michigan to Danville, Ill., via Lake Maxinkuckee, Momence and this place.

EAU CLAIRE, WIS.—The Chippewa Valley Electric Railroad Company has been incorporated, with N. C. Wilcox, president; H. N. Bates, vice-president, and A. E. Appleyard, secretary-treasurer; to build and operate the interurban and Chippewa lines, and eventually own and operate the whole system, including this place; capital stock, $200,000.

MACON, GA.—The Macon & Indian Spring Railroad Company has purchased the Macon electric plant and will improve same, adding a 1,000-horse-power engine and other machinery.

Electric Light and Power.

COXSACKIE, N. Y.—The Coxsackie Electric Light Company has been incorporated; capital stock, $20,000. The directors are James G. Newbury, Irving A. Newbury and Archer H. Newbury, of Coxsackie.

PORT JERVIS, N. Y.—Pierce & Miller are equipping an electric lighting plant at this place.

ELMER, PA.—There is a movement here for the erection of an electric light plant.

MIAMI, FLA.—An electric light plant will be established at this place.

LAWRENCEBURG, KY.—J. W. Waterfill, Clerk of Council, may give information concerning proposed electric light plant.

COLUMBIA, TENN.—E. Yoest, Mayor, may be addressed concerning electric lighting.

New Incorporations.

CHICAGO, ILL.—Chicago Pneumatic Company has been incorporated, to maintain and operate a system of pneumatic tubes; incorporators, Blewett Lee, Dwight Lawrence, Thomas P. Sheldon; capital stock, $100,000.

CHARLESTON, W. VA.—The Hogan Electric Company has been incorporated by Alf Brittenham, E. A. Botkin, A. G. Vickers, John E. Laughlin and G. W. Arbogast; capital stock, $100,000.

ALEXANDRIA, VA.—The Victor Electric Company has been incorporated with Cloudo M. Thouless, for the purchase, sale, lease, etc., of all electric devices, lamps, etc.; capital stock, $25,000.

Increase of Capital.

PEORIA, ILL.—The Diamond Electric Company have increased their capital stock from $60,000 to $100,000.

KIND WORDS.

READS FROM COVER TO COVER.

TO THE EDITOR OF ELECTRICAL REVIEW:

I like your paper very much and read every copy from cover to cover.

May 10. W. S. FORD.

WANTS EVERY NUMBER.

TO THE EDITOR OF ELECTRICAL REVIEW:

Enclosed find check of $3 in payment of the ELECTRICAL REVIEW from November, '97, to November, '98. I am glad you continued to send me the REVIEW. I would not have missed an issue for a great deal.

May 12. H. E. MURTY.

At the present time, syndicates controlled through the office of Messrs. Tucker, Anthony & Company, of Boston, have 60 miles of electric roads under construction as follows: Fall River to Newport, 16 miles; Providence to Fall River, 18 miles; Providence to Taunton, 19 miles; South Framingham to Marlboro, eight miles; total, 60 miles. With the completion of these roads over 200 miles of electric roads will be controlled through Messrs. Tucker, Anthony & Company's office.

Notice to Advertisers.

There is great activity, particularly throughout the West, in electric power transmission, electric lighting, street railway construction, and the electrical industries in general. The ELECTRICAL REVIEW is read by every one assisting in this development. Manufacturers and dealers in apparatus and supplies can reach them through its advertising columns. Remember the Conventions of the National Electric Light Association and the Northwestern Electrical Association, which occur June 7-9, and June 10-14, respectively.

THE ELECTRICAL SHOW.

(Concluded from page 339.)

shown in operation driving a small dynamo by means of a link belt. The American Engine Company, of Bound Brook, N. J., exhibits an American-Ball engine direct-connected to a dynamo. This is also a remarkably handsome exhibit, and the apparatus shown was sold during the first week of the exposition. The New York Safety Steam Power Company has an operative exhibit of their well known steam engines. The Diesel motor stands in a class by itself and has attracted a great deal of attention, especially from the members of the lodges of stationary engineers, which have been holding meetings during the show.

The American Ball Engine Company—"Built like a watch" has become a trite byword. Some watches are well built, others stamped out and thrown together. But no such type of construction can apply to the building of an engine. The beautiful exhibit of the above company arrests the attention instantly. Every trick of ingenuity in the machine shop is, in this engine, developed to its highest phase. The design is clean cut, the parts are of the simplest form, and every pound of iron and steel is arranged to do its work to the best advantage. The type shown is a 35-horse-power direct-connected high-speed automatic, and it is safe to say no one has ever seen a more smooth-running engine. The crank and rod are covered, and nothing is seen in motion except the flywheel and valve rods. No oil can be thrown, and the engine always looks neat and clean.

Removal Notices.

The American Stoker Company is now nicely located in its new offices in the Washington Life Building, New York. These offices are very complete and convenient, and this thoroughly progressive company is visited daily with new customers from the central station field.

The A. L. Bogart Company has moved to 123 Liberty street. This brings the company more into the center of electrical trade. The officers of the company are W. B. M. Jordan, president; A. L. Bogart, treasurer and manager; D. H. Walker, secretary.

The Citizens' Telephone Company, of Grand Rapids, Mich., has increased its stock from $100,000 to $200,000.

TELEPHONE NEWS AND COMMENT.

The telephone company at Youngstown, Ohio, will expend within the next three months $35,000 in improving lines and fitting a new exchange.

The American Telephone and Telegraph Company has issued a war atlas with a marginal index. It contains excellent maps of all the countries of the world, with enlarged maps of the territories in which battles are likely to occur.

The Mankato, Minn., Citizens' Telephone Company, which was organized last Winter, will commence operations in a few weeks; 175 instruments have been contracted for for five years at $2 per month. The capital of the company is $10,000, with Attorney Lorin Cray, president.

The Postal Telegraph Company announces that messages for Spain in code or cipher can be accepted at sender's risk only. The Italian administration announces that private messages in cipher or code are prohibited. Private messages, however, addressed to the Bank of Italy, Rome, are admitted in code or cipher.

The new State Telephone Company, of Lapeer, Mich., has begun operations with 125 telephones in service. Its only line at present, leading to Lapeer, is from Detroit. Connections are being made with all the villages in the county. The Moore Telephone Company intends forming a junction with the State company to the North.

Telephone connection is to be made with the Plum Island lighthouse and life-saving station right away, in accordance with the orders and plans of the war department. The men at the stations are to be educated in the uses of the telephone, and so far as possible the lines will be utilized for the welfare of the government in its various services.

A rumor is current in Boston financial circles that the American Bell Telephone Company is contemplating a bond issue. The company has $2,000,000 six per cent debenture bonds which mature in August and it is possible that the company may issue new bonds to take up the maturing issues. It is good outside opinion, however, that the bonds will be paid off at maturity from the company's surplus. A director says: "We have not yet decided whether we will pay off the bonds or exchange for new bonds. The company has plenty of money on hand and besides has given President Hudson authority to sell by auction the 1,500 shares of stock remaining in the treasury, which stockholders did not take."

St. Joseph, Mo., has two telephone systems. The Missouri & Kansas, Telephone Company owns its exchange and general headquarters building on South Seventh street. F. W. Mackey is local manager for the company and has in his employ 40 persons, including operators. The pay-roll of the company will aggregate $20,000 a year. The company has 900 subscribers and about 2,000 miles of wire in St. Joseph alone—1,020 miles of which is overhead and 980 miles in conduits. St. Joseph was the first city in Missouri to be provided with an underground telephone system. The Citizens' Telephone Company was organized in 1894 and began business January 1, 1896. The company has about $150,000 invested in its plant and has 750 subscribers and about 2,000 miles of wire in St. Joseph. This company was organized and the plant put in by home capital entirely. The company has 30 employés and its annual pay-roll is $12,000. J. J. Newell is president of the company; M. M. Riggs, vice-president; George A. Moss, secretary; R. S. Frazier, treasurer; R. M. Martin, superintendent of construction. Toll lines extend to 70 towns in the country tributary to St. Joseph.

FOR SALE . . .

One 150-h.-p. Single-Cylinder Ball & Wood Engine, 16 x 16, 250 R. P. M. In first-class condition.

Two 60-k.-w. Edison Bi-polar Dynamos, in A No. 1 order.

One 60-inch 3-ply Leather Belt, 96 feet 0 inch long. Run but a short time.

For further particulars, address
J. F. OUTWATER,
360 Pearl Street,
Brooklyn, N. Y.

AN electrical and mechanical establishment wishes for direct connections with manufacturers of machinery for electrical plants. Please address,
S. C., 638,
Care Aug. J. Wolff & Co.'s Advertising Office,
COPENHAGEN, K.

A BARGAIN.

We have for sale a 25-horse-power horizontal engine (Nagle, Erie, Pa.) and boiler for same; only used a short time; good as new. Will be sold low.

Address A. H. Potts & Co.,
Parkesburg, Pa.

IRON ROOF FOR SALE.

Width of building, 155 ft., out to out, divided into a center span 66 ft., with a wing on each side 43 ft., 6 in.; total length of the building, 350 ft. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an iron foundry, but owing to the failure of the purchaser is now offered for sale at a bargain. Is admirably adapted for a foundry for light or heavy castings, machine shop, car barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.

Apply to
THE BERLIN IRON BRIDGE COMPANY,
EAST BERLIN, CONN.

WANTED.

Position, by an electrician. Familiar with electric street railway work and telephone work. Good references furnished.

Address "A. W. K.,"
care Electrical Review, N. Y.

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A responsible concern to handle and sell a Metallic Gutter for street cars, drained by tubular spouts running down the uprights, disguised as hand rails. Should be applied to every open street car. (Device patented.

CHARLES A. MANN,
BANGOR, ME.

Bargains in Dynamos, Engines, Etc.

Direct-current dynamos of 350, 700, 725, 800, 810, 900, 1,075, 1,350, 1,610 and 2,500 light capacity.
Alternating-current dynamos of 750, 900, 1,300 and 2,000 light capacity.
Arc dynamos, 20, 24, 30, 40, 50 and 60 lights, both 1,200 and 2,000 candle-power.
Engines, 50, 75, 85, 100, 115, 125, 150, 175 and 200 horse-power.
Boilers, 100, 250, 375 and 500 horse-power.
Heaters, 150 and 2,000 horse-power.
Pumps, all sizes.

Write us for Price-list No. 21.

This apparatus has been removed from our own Central Stations to make room for larger units. We therefore know its history and can guarantee it to be in thoroughly good operative condition.

CHICAGO EDISON COMPANY, 139 Adams St., CHICAGO.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED MAY 17, 1898.

604,033 Electrical safe protecting system; I. Freed, Harrisburg, Pa.

604,055 Electro-magnet having rotating fields; W. Langdon-Davies, London, England—An electro-magnet having a rotating field, resulting from two windings carrying currents differing in phase, asymmetrically arranged upon the core and inclined the one to the other at an oblique angle, which is the supplement of the angle by which the current in the two windings differ in phase.

604,081, 604,082, 604,083, 604,084, 604,085 Electric lighting system and apparatus for railroad cars; W. F. Richards, Buffalo, N. Y.—The combination with a car-body having a transverse track on its under side, and a car-truck and its axle, of a dynamo capable of lateral movement on said track, and a pivoted frame which connects said dynamo with the truck and moves laterally with the track.

604,094 Telephone switchboard plugs; J. Taylor, Heathercliffe Helsby, England.

604,098 Rail conductor for electric system; L. E. Walkins, Springfield.

604,101 Electric lighting apparatus for electric cars; W. F. Richards, Buffalo, N. Y.—The combination with a railway vehicle and its axle, of an inclined track or way arranged lengthwise on the underside of the vehicle, a carriage mounted on said track, a dynamo adjustably attached to said carriage, and a frictional driving mechanism whereby the dynamo is driven from said axle.

604,128 Electrical apparatus for operating elevator doors; H. R. Smith, Chicago, Ill.—In an apparatus of the class described, a motor comprising a relatively movable solenoid and core, a door and connections between said door and the movable part of said motor, in combination with an armature arranged to be actuated by the energization or de-energization of said solenoid, and a lock for the door actuated by the operation of said armature.

604,196 Trolley for electric railways; S. H. Short, Cleveland, Ohio—In an electric railroad, an overhead conductor and a trolley-arm mounted upon the car, combined with a horizontal cylindrical roller mounted upon the upper end of the trolley-arm, a sleeve secured upon said roller between its ends, a rod extending through the roller and the ends of the arm, and ball-bearings placed upon the rod and fitting in the ends of the roller.

604,219 Electric arc lamp; F. W. Steinacker, Cleveland, Ohio—In an electric arc lamp, in combination a plate, a thimble, a lever pivoted about said thimble and supported by said plate, rods passing through said plate, forks on said lever adapted to take around said rods, there being notches in the rods and corresponding ribs on said forks.

604,340 Combined annunciator and spring-jack; G. W. Sutton, New Rochelle, N. Y.—In a spring jack-switch, the combination with a contact having a bent portion, of a contact spring having a cam and a bent portion, which is adapted to contact with the bent portion of the first said contact with a rubbing motion.

The New Independent Telephone Exchange at Elkhart, Ind., where a new 500 line Stromberg-Carlsen equipment is being installed, is rapidly nearing completion under the active supervision of Manager Bickel. No pains are being spared to make everything first-class, and with such excellent apparatus as the Stromberg-Carlsen, Elkhart can soon boast of a modern telephone exchange.

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MADISON SQUARE GARDEN
IS A
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IN FULL OPERATION.
All particulars regarding rates and other details will be furnished by those in charge of the Exhibit or at the Contract Offices of the
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Quick-Break Switches.
If you desire the best, latest and most improved quick-break switch on the market, get the
"DEMARY."
They are all made of the best material that can be obtained, and all parts are standard in size.
These switches are made in one grade only, highly polished and lacquered.
Send for Catalogue and Prices.
They will interest you.
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133 Erie County Bank Building. BUFFALO, N. Y.
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CROFTON STORAGE BATTERY CO.
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VERY LIGHT BATTERIES
A SPECIALTY.
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THIS CO HAS BEEN MAKING
TELEPHONES
20 YEARS, NOT CHEAP BUT
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CIRCULARS FURNISHED.
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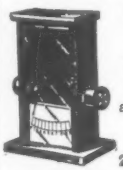
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"ELECTRICITY AT THE COLUMBIAN EXPOSITION."
A Chance to get an Interesting Book at Small Cost.
It is now nearly four and one-half years since the close of the great World's Columbian Exposition, held in Chicago. Every vestige of the famous electrical display at which the people gazed and wondered has disappeared. The people have gone, the buildings have been removed, the drives and walks changed and the Exposition grounds once more transformed into a beautiful park.
Electricity at the Columbian Exposition, however, lives not only in the memories of the people who have seen it, but also in a more substantial form in the shape of a five-hundred-page book compiled by John P. Barrett. This book, "Electricity at the Columbian Exposition," contains eighty-four handsome full-page illustrations, sixteen of which show exterior views of the buildings at night. The brilliant illumination of the buildings by both incandescent and arc lights made it not only possible to photograph them after nightfall, but also gave unique and artistic results. Seventeen of the full-page illustrations are general views giving pictures of the fountains and statuary, and there are also fifty full-page pictures of the various exhibits.
The paper used in this book is finely finished enameled book paper, which allows for the best effect in printing illustrations. The text is generally descriptive of the various exhibits and of the buildings, and also contains several reports of the expenses and the operation of the intramural railway, and several short historical introductions to the descriptions of the various departments of electricity.
The price of this book, bound in cloth, is $1.00. It is supplied by the
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FLAT OR ROUND WIRE, STEEL OR BRASS. A complete assortment of high-grade COLD ROLLED STEEL kept in stock, .003 to .049 inch thickness.
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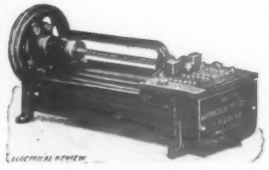
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Desiring a thoroughly reliable Automatic Starting Apparatus for electric pumps, elevators and other intermittent work, can not do better than send for our catalogue of Motor-Driven Starters and Specialties. No dash-pots, shunt magnets or other delicate mechanism, yet automatic start and instantaneous release under all conditions.
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ALL KINDS. COMMUTATOR SEGMENTS ASSEMBLED READY FOR USE. ARMATURES REWOUND.
NEW, REFILLED, REPAIRED. Write for Prices. F. E. HOMER & CO., CLEVELAND, OHIO.

Kindred.... ...Interests

The Berlin Iron Bridge Company, of East Berlin, Ct., have just completed a fireproof boiler house for the Hendey Machine Company, of Torrington, Ct.

The well known telephone firm of De Veau & Company are remarkably busy in their new factory, 27 Rose street, New York. The company make a standard line of exchange, long distance, interior instruments and switchboard apparatus.

The Willard Batteries in Paris.—Messrs. Sipe & Sigler, Cleveland, Ohio, have received orders for Willard batteries from the Riker Electric Motor Company, of New York, and the Fischer Equipment Company, of Chicago, for motor vehicles sold in Paris.

The American Stoker Company, Washington Life Building, Broadway and Liberty street, New York city, has issued a handsome catalogue describing its well known stoker. Readers of the ELECTRICAL REVIEW may obtain a copy of the catalogue free on application.

The Electric Storage Battery Company, of Philadelphia, is issuing as a souvenir of the New York Electrical Exposition a celluloid foot-rule advertising the chloride accumulator. The rule folds in three sections and is flexible, so that curved and irregular surfaces may be measured. It is a useful novelty.

The Jandus Electric Company, of Cleveland, Ohio, report an excellent demand for their enclosed alternating "Jandus" arc lamps. Many leading alternating central station plants have adopted this lamp for exclusive use. Catalogue and prices can be had from Cleveland or 753 Monadnock Building, Chicago.

The Westinghouse Electric and Manufacturing Company has sold to the Citizens' Street Railway Company, of Indianapolis, a 500-kilowatt, 90-revolutions-per-minute machine of the Westinghouse standard type. The machine is direct-connected to an Allis-Corliss engine. It is over-compounded 10 per cent, the normal potential being 550 volts.

Central Electric Company calls especial attention to its complete stock of double and single silk and cotton-covered magnet wires, up to and including No. 40 gauge. Those whose requirements in this line are liable to vary, as regards size and insulation, will appreciate the convenience of having prompt shipments made from Chicago stock.

The "Buckeye" special anchored filament, 220-volt lamp, is said to be proving in actual service to be just what the central station managers and lamp consumers generally have been looking for, and that there need be no more drooping filaments, blackened bulbs and abnormal loss of candle-power. The Buckeye Electric Company, of Cleveland, Ohio, build lamps on the theory that "the best is none too good." Catalogue and prices for the asking, Chicago office, 753 Monadnock Building.

The Armington & Sims Company, Providence, R. I., have established a Philadelphia agency for their engines. F. E. Bailey & Company, of that city, will look after the interests of this company in that part of the country. The new 1898 pattern manufactured by this company has met with a very popular reception from the electrical field, and the Providence factory is quite busy filling orders. Mr. W. F. Haring, of the Washington Life Building, New York city, is the agent in the metropolis, and is sending in orders every day or two.

The new power station and car house being erected by the Spencer, Warren & Brookfield Street Railway Company, at Brookfield, Mass., will have steel roof trusses and covering furnished by the Berlin Iron Bridge Company, of East Berlin, Ct. The dynamo and engine-room roofs of this building will be lined with the Berlin company's patent anti-condensation roof lining, which is now almost universally used for roofs of this nature throughout the country. It prevents the condensation of moisture from the underside of the roof covering, which, if it should collect and drop upon the machine beneath, would cause considerable damage.

"The Handbook of Useful Information for Practical People," compiled by Mr. Forée Bain, of Chicago, the mechanical and electrical engineer, may be aptly compared to a compressed food tablet, containing a vast amount of valuable information in exceedingly small form. How well Mr. Bain succeeded in collecting and compiling the thousand and one things to be remembered by the electrical or mechanical engineer or inventor in such compact and attractive form can best be judged of by sending for a complimentary copy.

Mr. A. F. Morell, manager of the electrical department of the Miller-Knoblock company, South Bend, Ind., is away on a few days' trip east looking up some business matters. How confident the Miller-Knoblock company feels of its ability to turn out first-class work was shown recently when a very particular case of rewinding a high-tension armature was submitted to them. Ordinarily a repair concern would not guarantee work of this kind; in fact one refused to do so for even 10 hours. The Miller-Knoblock people offered to be responsible for the work for 30 days. The armature has run daily ever since, which was some three weeks ago.

The Crofton Storage Battery Company, Chicago, who some time ago announced having perfected an entirely new battery plate, is now in position to supply, on short notice, batteries made with the new plate. Briefly described, the plate consists of a plate of rolled lead, with perforations similar to those of a sieve. This plate is placed in a corrugated or grooved mold and molten lead poured in, combining and interlocking with the perforated support. The cast grid is then pasted in the usual way and passed through a set of rollers, causing a light feather edge to be formed on the edges of the corrugations, thereby holding the active material in place. This method of manufacture is claimed to give very favorable results, combining cheapness with large capacity and great endurance.

The two splendid new trains, happily named "The Pioneer Limited," which the Barney & Smith Car Company have constructed for the Chicago, Milwaukee & St. Paul Railway Company, are ready for service between Chicago, Milwaukee, St. Paul and Minneapolis, and a "private view" proves the assertion that they are the most magnificent product of the car-builder's art ever yet exhibited. These duplicate trains consist of the usual mail, express, and baggage cars (the latter furnished with bicycle racks, and carrying a Westinghouse engine and dynamo to furnish power for the electric lighting of the entire train), buffet, smoking and library cars, standard sleepers, compartment sleepers, dining cars, parlor cars, day coaches and reclining chair cars. Entrance to each car is by way of massive "flush" vestibules, finished in San Domingo mahogany, the elegance of which is but a hint of the superb display within.

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A Pocket Voltmeter.

The Whitney Electrical Instrument Company, Penacook, N. H., is manufacturing a line of pocket voltmeters and milammeters for continuous current. They are made in the form of a watch, as will be seen from the accompanying illustration of the voltmeter.

This instrument has a range from zero to five volts, and was designed to meet a demand among battery users

THE WHITNEY POCKET VOLTMETER.

for a low reading and convenient voltmeter. The principle of construction is the same as that of the Whitney company's standard portable voltmeters for direct current, and the instrument is built with the same care. It is accurately calibrated, and the scale is drawn in by hand. The works are mounted in a handsome silveroid case, which will remain bright indefinitely, and is about the same size as a gentleman's watch.

With this pocket voltmeter, the operator of an electric vehicle, or the engineer of an electric launch, can quickly determine which of his accumulators are "dead" and cut them out, thereby getting the full benefit of the good cells.

Telegraph Operators in Demand.

The demand for telegraph operators is greater than at any other time in history. There is scarcely an idle operator in the country. The Signal Corps has absorbed thousands of them and the commercial companies have employed all in sight.

Men who are operating the key are making 50 cents an hour and working just as long as they please. The companies would be glad were each man to work 24 hours a day.

Operators who have outlived their usefulness, either by reason of age or bad habits, have been called again into service.

The government has recruited the Signal Corps, and then the Signal Corps of the various states have made heavy drafts on men who can send and read electric messages.

Any operator can get a job. The men of the key now swell out their chests and are happy.

The Boston *Herald* announces that a party who lately investigated Westinghouse Electric affairs says: The showing is very good and they have been making good profits and now have orders on hand which will last until July. There is about $400,000 in the treasury and the bonded indebtedness has been reduced about $200,000 in the last two years, besides paying operating expenses and interest on preferred stock.

TRADE NEWS.

The Swett & Lewis Company, of Boston, have sent to the ELECTRICAL REVIEW a very handsome radiograph made by means of a static machine, showing the hand of a mummy. It is a remarkably clear and well executed example of radiography.

A. L. Bogart Company has removed its business to 123 Liberty street, New York city, in order to be nearer the center of metropolitan electrical trade. The offices at 50 East Twentieth street will remain open until June 1 for the receipt of orders, etc.

The Western Electric Company, of Chicago, has issued a bulletin describing its ceiling fans for direct current. These are made in numerous styles and finishes, and a full line is carried in stock. The descriptive bulletin may be had free on application.

The Automatic Switch Company, of Baltimore, have appointed the following agencies: For New York city and New Jersey, D. H. Darrin, Vanderbilt Building, New York; for Michigan, Wisconsin, Illinois, Indiana and Iowa, Harding & Hammer, Marquette Building, Chicago; for Louisiana, Vincent Gray, New Orleans.

The Western Electric Company has issued a 24-page pamphlet on tools, which contains a most complete list of lineman's and construction tools, all of which can be furnished from stock. Every one interested in the construction of electric lines should have a copy, and the Western Electric Company will mail one upon request to any one desiring it. This pamphlet is known as "Tool Catalogue No. 3."

The Electric Appliance Company, Chicago, have recently concluded the general distribution of their fan catalogue for the season of 1898. In sending out catalogues to a very large list of buyers it is very often the case that some are overlooked. The Electric Appliance Company would be very pleased to hear from any of the trade who have not received a copy of this handsome catalogue, as they are anxious to place the same in the hands of every possible user or purchaser of fan motors.

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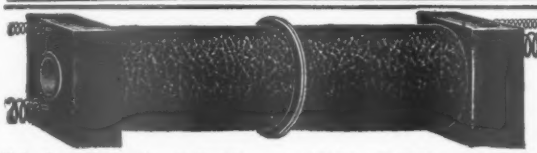
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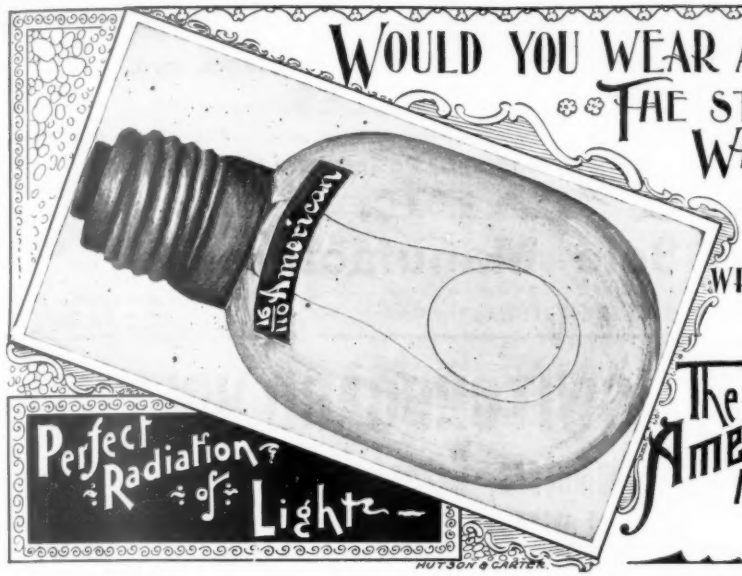

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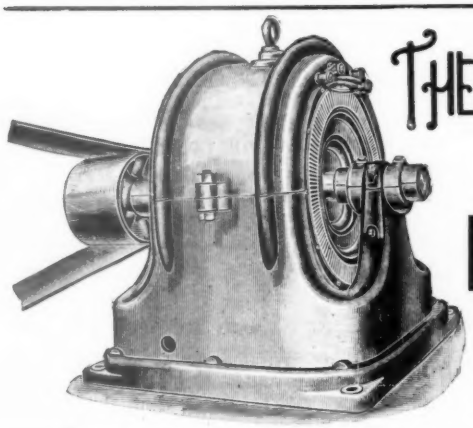

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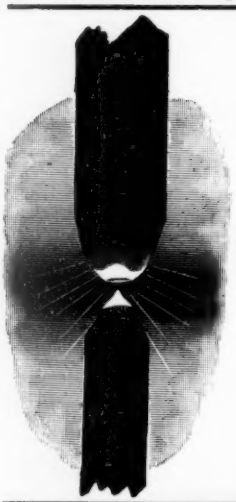

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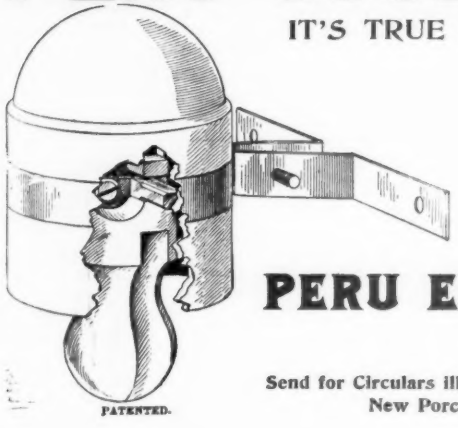

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